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TENNESSEE VALLEY AUTHORITY BOARD

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LISTENING SESSION

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ON

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ENERGY EFFICIENCY/DEMAND RESPONSE

10

AND RENEWABLE ENERGY

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MARCH 5, 2008

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701 HENLEY STREET

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KNOXVILLE, TENNESSEE

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DAY II OF II

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25

1 LISTENING BOARD

2 TOM KILGORE
 3 BILL SANSOM
 4 DENNIS BOTTORFF
 5 HOWARD THRAILKILL
 6 DON DEPRIEST

7
 8 TVA MODERATOR: GIL FRANCIS

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08:29:30 1 MR. BOTTORFF: I'm Denny Bottorff. I
08:29:32 2 chair this ad hoc committee on renewable
08:29:36 3 energies this morning and on conservation and
08:29:40 4 demand response. Here on the -- from the Board
08:29:42 5 today is Tom Kilgore who is the CEO of TVA,
08:29:48 6 which all of you know, Bill Sansom who is
08:29:52 7 Chairman of the Board of TVA, Howard Thrailkill
08:29:54 8 who is the Chair of the Operates Committee, and
08:29:56 9 Don DePriest who chairs the Government's
08:30:00 10 Committee as well as -- what's your other
08:30:00 11 committee, Don?

08:30:02 12 MR. DEPRIEST: Community Relations.

08:30:06 13 MR. BOTTORFF: Community Relations.
08:30:08 14 So Don does -- has dual responsibility. In the
08:30:10 15 strategic plan that was laid out, we set a
08:30:14 16 specific goal for affecting the growth rate in
08:30:18 17 demand, to reduce that growth rate by
08:30:22 18 1200 megawatts over the next five years. At
08:30:24 19 that time, though, we did not really put in
08:30:26 20 place what I would call a plan of implementation
08:30:30 21 about how are we going to really achieve that.

08:30:34 22 Yesterday -- we did put in place
08:30:36 23 changes -- or Tom Kilgore put in place changes
08:30:38 24 within the organization structure of TVA to
08:30:40 25 begin to figure out how to put in place a plan

08:30:44 1 of implementation to achieve that goal and to
08:30:46 2 validate it or maybe even do better.

08:30:50 3 Yesterday we heard what was the first
08:30:52 4 of a series of listening sessions in which we
08:30:56 5 got input from the community about how to affect
08:31:02 6 conservation and demand response or peak load.
08:31:04 7 That was an excellent session for those of you
08:31:08 8 that were here yesterday.

08:31:10 9 Today we're going to focus on
08:31:12 10 renewables and so I hope today -- you guys have
08:31:16 11 got a lot to live up to to be as good today as
08:31:18 12 they were yesterday. And with that, Gil --
08:31:22 13 where is Gil? Gil, do you want to introduce the
08:31:24 14 panel, who will be the moderator for the panel.
08:31:26 15 Oh, Anda is going to do this today. I'm sorry,
08:31:28 16 Anda. Anda, you're the moderator for today.
08:31:32 17 Thank you very much.

18 MS. RAY: Actually, thank you, Director
08:31:34 19 Bottorff and good morning to the Board and to
08:31:36 20 Mr. Kilgore, the panels, the interested public,
08:31:40 21 and the media.

08:31:40 22 Yesterday we had the energy efficiency
08:31:44 23 panel, as you mentioned, and that was discussing
08:31:46 24 one of the cleanest options for addressing the
08:31:48 25 Valley's growing energy needs. Today we're

08:31:52 1 going to address one option for a cleaner
08:31:54 2 generation. We want to make sure that whatever
08:31:58 3 options we look at, any investment in new
08:32:00 4 generation, we need to make sure we do a careful
08:32:04 5 study and strategic planning to meet the needs
08:32:06 6 and the resources that are located here in the
08:32:08 7 Valley. We want to have sustainable generation
08:32:10 8 portfolio, one that's cleaner and reliable and,
08:32:14 9 as Mr. Kilgore says, still affordable.

08:32:18 10 Today, the morning, we're going to hear
08:32:20 11 from several experts on the panel. They're
08:32:22 12 going to give us their perspective on how we can
08:32:24 13 develop renewable sources in the Valley.

08:32:26 14 As the Board mentioned in the TVA
08:32:28 15 Strategic Plan, TVA is committed to increasing
08:32:32 16 its renewable generation as a part of our effort
08:32:34 17 to reduce greenhouse gases. So we're going to
08:32:38 18 look at the renewables in three separate panels
08:32:40 19 today. They're focussed on policy,
08:32:42 20 environmental, and then technology. This
08:32:44 21 session is an initial step in helping TVA
08:32:48 22 develop a comprehensive renewable strategy so
08:32:52 23 that we can better serve the Valley with cleaner
08:32:54 24 energy. And with that, I look forward to
08:32:56 25 hearing the panel discussion and the public

08:33:00 1 comments afterwards. Gil.

08:33:02 2 MR. FRANCIS: Thank you. Before I
08:33:02 3 introduce the panel, just a few housekeeping
08:33:04 4 items. The restrooms are through the main door,
08:33:08 5 past the escalators, past a short hallway on
08:33:10 6 your right. Please turn off all cell phones.
08:33:12 7 And we ask that members of the public who are
08:33:14 8 going to comment later today, please sit at the
08:33:18 9 front to help save time when we call your name
08:33:20 10 to come up to speak.

08:33:24 11 At this time, let me introduce the
08:33:24 12 panel. Again, we'll have three panels. Each
08:33:28 13 panel will consist of four panelists who provide
08:33:28 14 10 minutes of remarks each. Following the
08:33:32 15 remarks, the Board members may have follow-up
08:33:34 16 questions of panelists. Following the last
08:33:38 17 panel discussion, there will be an hour for
08:33:40 18 comments from those in the audience who have
08:33:42 19 registered to speak.

08:33:44 20 Our first panel discussion will look at
08:33:48 21 renewable energy policy. Members of this panel
08:33:48 22 are, from left to right, Dr. Stan Bull,
08:33:52 23 Executive Director for Strategic Partnerships at
08:33:56 24 the National Renewable Energy Laboratory; Kirk
08:34:00 25 Johnson, Vice President of Environmental Policy

1 at the National Rural Electric Cooperative
08:34:06 2 Association; Paul Sloan, Deputy Commissioner of
08:34:08 3 Environment at the Tennessee Department of
08:34:10 4 Environment and Conservation; and James
08:34:14 5 Williams, Government Relations Representative at
08:34:16 6 the American Public Power Association.

08:34:18 7 Dr. Bull, would you begin, please?

08:34:22 8 DR. BULL: I want to begin by thanking
08:34:24 9 TVA for inviting the National Renewable Energy
08:34:26 10 Laboratory to come before you this morning. And
08:34:32 11 the second thing I should say is that frankly
08:34:32 12 I'm probably more of a technologist than a
08:34:34 13 policy wonk. So I will talk technology a bit
08:34:38 14 and hope that somebody in the technology session
08:34:42 15 talks more about policy to make up for that.

08:34:44 16 So let me begin with a short statement
08:34:48 17 first. Interest in renewable energy
08:34:50 18 technologies has intensified in the United
08:34:52 19 States and around the world as a result of
08:34:56 20 heightened concerns about climate change and
08:34:56 21 energy security stemming from rising demand and
08:35:00 22 uncertain future supplies. Governments at all
08:35:02 23 levels have enacted policies and launched
08:35:06 24 initiatives designed to accelerate the
08:35:08 25 development of renewable energy resources.

08:35:08 1 Most policies purposely work within
08:35:12 2 existing energy markets to promote renewables.
08:35:16 3 Renewable energy, in fact, represents a diverse
08:35:20 4 set of resources and technologies that are in
08:35:20 5 different stages of maturing to deployment and
08:35:24 6 policy instruments must make those difference --
08:35:28 7 take those differences into account.

08:35:28 8 Renewable energy is derived from
08:35:30 9 resources that are generally not depleted by
08:35:34 10 human use such as the sun, wind, and movement of
08:35:38 11 water. These primary sources of energy can be
08:35:42 12 converted into the heat, electricity, mechanical
08:35:46 13 energy in a number of ways. There are some
08:35:46 14 mature technologies for conversion of renewable
08:35:50 15 energy such as hydropower, biomass, and residues
08:35:54 16 and waste. Other conversion technologies such
08:35:56 17 as wind turbines and photovoltaics are well but
08:36:00 18 do they -- they do not yet have the efficiency
08:36:04 19 or market penetration that they will ultimately
08:36:06 20 achieve. Although geothermals produced from
08:36:08 21 geological sources that decline over time, it is
08:36:10 22 often considered a renewable energy resource.

08:36:14 23 Despite fluctuating government policies
08:36:16 24 since the 1970s, a combination of incentives and
08:36:20 25 high energy prices has enabled wind energy, in

08:36:24 1 particular, to gain a growing presence in
08:36:28 2 electric power markets.

08:36:28 3 So as we look at the TVA situation, the
08:36:32 4 first thing, from my point of view, is what is
08:36:36 5 the resource that's available. One of the
08:36:40 6 businesses that we're in is looking at resources
08:36:44 7 and we do that for solar, wind, biomass, and
08:36:48 8 geothermal. And I think the first one we can
08:36:52 9 generally discount here is geothermal. In the
08:36:54 10 future there will be the possibility to tap into
08:37:00 11 geothermal sources as we go to enhanced
08:37:04 12 geothermal systems with very deep drilling, but
08:37:06 13 that doesn't exist today. So let me back up and
08:37:10 14 say, let's look at the other three, solar, wind,
08:37:12 15 and biomass.

08:37:12 16 I also understand that wind -- and
08:37:16 17 certainly our maps validate this -- wind is not
08:37:18 18 a very robust source. Except for some
08:37:22 19 locations, ridges and that sort of thing, and I
08:37:24 20 know you do have some wind installed today. I
08:37:26 21 would say that the one thing to think about as
08:37:30 22 the industry goes to taller and taller towers
08:37:32 23 and larger and larger devices, that it will open
08:37:36 24 up many areas that have been previously
08:37:38 25 considered out of bounds for wind. But

08:37:40 1 nevertheless, it's not like the North Dakota,
08:37:44 2 South Dakota, and Montana area in terms of very
08:37:46 3 robust wind source. So it's somewhat limited, I
08:37:50 4 would say.

08:37:50 5 So that really leaves biomass and
08:37:54 6 solar. Solar sometimes -- maybe today we might
08:37:58 7 have a hard time believing that you have a good
08:38:02 8 solar resource, although maybe it will turn out
08:38:04 9 later that that's the case. In the desert
08:38:04 10 Southwest is where the best, of course, sunlight
08:38:06 11 is and direct use of solar using parabolic
08:38:14 12 troughs and that sort of thing. It's probably
08:38:16 13 not viable here. But roof tops -- and I'll come
08:38:18 14 back to this later. You shouldn't discount the
08:38:22 15 solar resource you have here. And I think
08:38:24 16 biomass is also another area that is ripe for
08:38:28 17 application and opportunity here.

08:38:30 18 If we look at the renewable
08:38:32 19 technologies and in particular the three that I
08:38:34 20 mentioned, solar, wind, and biomass, the cost
08:38:40 21 reductions have been impressive over the --
08:38:42 22 since 1980 until today, which is roughly
08:38:46 23 27 years. And, for example, wind's cost
08:38:48 24 reduction has been a factor of 10,
08:38:52 25 photovoltaics, the most likely solar

08:38:54 1 application, cost has been reduced by more than
08:38:56 2 a factor of 5, and biomass has been more modest
08:39:00 3 because it hasn't been in the -- on the research
08:39:02 4 agenda for electricity applications. Most
08:39:06 5 biomass research has been for purposes of fuels
08:39:10 6 reduction, which is another issue but not one we
08:39:14 7 will focus on today.

08:39:16 8 It turns out that renewables are the
08:39:18 9 most rapidly growing new capacity of the --
08:39:24 10 growing from in 2004 2 percent of the new added
08:39:26 11 capacity in the United States to 11 percent in
08:39:28 12 2005 to 22 percent in 2006. So it's on a very
08:39:32 13 rapid growth rate. And we now have from
08:39:36 14 renewables in the United States 29 gigawatt
08:39:40 15 installed. That's primarily dominated by wind
08:39:44 16 and by biomass to electricity and some
08:39:46 17 geothermal and then solar is coming on
08:39:50 18 relatively rapidly.

08:39:54 19 Wind cost goals are to reduce wind cost
08:39:58 20 further by a factor of 2 and wind, I said, was
08:40:02 21 one of the largest -- it's 16 -- yeah, 16.8
08:40:06 22 gigawatts installed now. Solar has yet to
08:40:10 23 achieve in the United States -- from flat
08:40:14 24 panels, solar panels, yet to achieve a gigawatt.
08:40:16 25 It's about 824 installed and we have a cost

08:40:22 1 target by 2015, so it's a longer term
08:40:26 2 proposition, but nevertheless a very good
08:40:28 3 application.

08:40:30 4 One area I do want to emphasize that
08:40:32 5 could be a game changer, and it's more in the
08:40:34 6 transportation sector, and that's plug-in
08:40:38 7 hybrids which would carry storage capacity I
08:40:40 8 think that will impact the utility and utility
08:40:42 9 grid potentially substantially, but you can take
08:40:44 10 advan -- I think you can learn to take advantage
08:40:46 11 of that either as a means for making use of off
08:40:50 12 peak -- when the demand is low or to balance out
08:40:56 13 intermittency of renewables because it
08:41:00 14 represents a storage capacity.

08:41:00 15 If we look at the current policy
08:41:02 16 environment for renewable energy, there's one
08:41:06 17 key Federal policy that's been driving the
08:41:10 18 development of wind and that's the production
08:41:14 19 tax credit and that's 1.9 cents a kilowatt hour
08:41:18 20 max. That expires at the end of 2008. So
08:41:22 21 unless that's continued by Congress, that will
08:41:24 22 become a real challenge for the continued
08:41:26 23 development. The House has passed a bill that
08:41:30 24 would extend it. The Senate has yet to act on
08:41:34 25 it.

08:41:36 1 And then the real primary driver in
08:41:38 2 this business is the states. There's 24 states
08:41:42 3 that have a renewable portfolio standard and
08:41:48 4 they -- of those 24, 11 of those states actually
08:41:52 5 require some amount of solar to be put in place.
08:41:56 6 But the primary way in which they're meeting
08:41:58 7 those portfolio standards and, you know, some --
08:42:00 8 just to give you an example, Oregon has
08:42:04 9 25 percent of their electricity to be provided
08:42:06 10 by renewables by 2025, for example. That's one
08:42:08 11 of the more aggressive. My own state of
08:42:12 12 Colorado is 20 percent by 2020. And it's a long
08:42:14 13 list. There's 24 states. And, like I said, 11
08:42:18 14 of them require some solar energy to be part of
08:42:22 15 that.

08:42:24 16 There's also within the states 16 of
08:42:26 17 them have renewable energy funds of various
08:42:30 18 sizes, California, Massachusetts and others, and
08:42:34 19 they use those for a variety of things, to
08:42:38 20 provide financial incentives for system
08:42:40 21 development, to provide price guarantees for
08:42:42 22 electricity from renewables. But they most
08:42:46 23 often also couple that with economic development
08:42:48 24 in that state and they also use those funds to
08:42:52 25 educate the public.

08:42:54 1 I know that you -- let me see here.

08:43:00 2 The other key element that helps enable

08:43:04 3 particularly the smaller renewable energy

08:43:06 4 outputs such as residential solar and, of

08:43:10 5 course, even commercial scale solar is net

08:43:16 6 metering and 42 states have net metering in

08:43:20 7 place. So there's almost all of them. Although

08:43:22 8 a certain number of the states in the TVA

08:43:24 9 service territory do not actually have that in

10 place.

08:43:28 11 Green power programs, they are

08:43:32 12 typically voluntary. Some are mandatory and I

08:43:34 13 know you have one in place and I understand that

08:43:38 14 is one that's a successful one.

08:43:40 15 So let me wrap up by just saying a few

08:43:42 16 things about why renewables. For one thing,

08:43:48 17 they often are cleaner, although they have to be

08:43:52 18 used properly and in an appropriate way.

08:43:54 19 Usually they don't use water, although, if you

08:43:58 20 use biomass. So there's always exceptions.

08:44:00 21 They are modular. It does draw on indigenous

08:44:06 22 and local and/or regional resources. And they

08:44:10 23 can be used in all sorts of scales, all the way

08:44:12 24 from utility scales to communities to farms and

08:44:18 25 ranches to business and then at individual

08:44:20 1 homes.

08:44:20 2 And my clock just ticked down to three
08:44:22 3 seconds, so we'll stop and entertain any
08:44:26 4 questions that you have at this point.

08:44:28 5 MR. FRANCIS: Thank you, Dr. Bull. Our
08:44:30 6 next speaker will be Kirk Johnson.

08:44:32 7 MR. JOHNSON: Good morning and thank
08:44:36 8 you very much for the invitation to be here.

08:44:36 9 I'm here on behalf of the Honorable Glenn
10 English, CEO of the National Rural Electric
08:44:42 11 Cooperative Association. He could not be here
08:44:42 12 today, but he certainly sends his regards and
08:44:44 13 his apologies for not being able to be here in
08:44:48 14 person.

08:44:48 15 We'll try to address the renewables
08:44:50 16 issue from some of what the cooperatives around
08:44:54 17 the country are doing and perhaps provide some
08:44:58 18 insights to the TVA Board about options that may
08:45:00 19 be available to you as you look forward in
08:45:00 20 planning for your future resource needs.

08:45:04 21 First off, let me start by saying, from
08:45:06 22 our perspective we try very much to encourage
08:45:10 23 all decision making to be done with the
08:45:12 24 interests and the well-being of the electric
08:45:16 25 consumers first and foremost in mind. Whether

08:45:20 1 those decisions are made by private boards or by
08:45:22 2 governments, it's critically important from our
08:45:24 3 perspective that fundamentally all decisions be
08:45:28 4 made keeping the interests of the consumer at
08:45:30 5 the end of the line first and foremost in mind.

08:45:32 6 With that, NRECA and cooperatives
08:45:36 7 around the country do fully support the
08:45:38 8 development of cost effective renewable energy
08:45:42 9 resources and it's important that they be cost
08:45:44 10 effective because that's the only way we can
08:45:48 11 keep the interest of the member consumers in
08:45:50 12 mind. We have cooperatives around the country
08:45:52 13 who are developing a variety of different
08:45:54 14 renewable energy resources and those resources
08:45:56 15 depend very much on where you are. As Dr. Bull
08:46:00 16 pointed out, where there may be geothermal
08:46:02 17 resources out west, they're not really available
08:46:04 18 to you here in the Valley. And so keeping an
08:46:06 19 eye on the local resources is very important.

08:46:10 20 And it's probably worth noting that one
08:46:12 21 of the most important renewable resources,
08:46:16 22 hydroelectric power is something that's rolling
08:46:16 23 on very extensively here in the Valley and by
08:46:20 24 the consumers of TVA and the cooperatives that
08:46:24 25 you serve who are our members. And keeping in

08:46:26 1 mind that that hydroelectric power is a
08:46:28 2 renewable resource we think is very important to
08:46:30 3 recognize and to celebrate because, A, it has
08:46:34 4 those renewable attributes and, B, it helps keep
08:46:36 5 costs very manageable for the consumers at the
08:46:40 6 end of the line.

08:46:40 7 And when you add in hydroelectric
08:46:42 8 renewable resources to the numbers that Dr. Bull
08:46:44 9 gave you, you come up with almost 100 gigawatts
08:46:46 10 of renewable energy capacity in the country and
08:46:50 11 that's roughly 10 percent of the electricity
08:46:54 12 capacity in the country. When you exclude the
08:46:56 13 hydroelectric renewables, you end up then with
08:47:00 14 about 1 to 2 percent of renewable energy
08:47:02 15 resources. And we think it's very important to
08:47:06 16 recognize those hydropower resources are
08:47:08 17 renewable energy sources.

08:47:10 18 We have cooperatives who are developing
08:47:12 19 other renewable resources, whether they are
08:47:16 20 biomass energy from capturing methane at
08:47:20 21 landfills, capturing methane from manure
08:47:22 22 digesters, from agriculture products, from wind,
08:47:26 23 from hydropower, capturing waste heat from a
08:47:32 24 variety of sources including natural gas
08:47:34 25 pipelines that crisscross the country capturing

08:47:38 1 waste heat off of those pipeline compressors,
08:47:38 2 and even looking into wave energy. Probably not
08:47:42 3 something here in the Valley, but certainly our
08:47:44 4 cooperatives on the coast are looking at wave
08:47:46 5 energy resources.

08:47:48 6 As a policy matter, we think it's very
08:47:50 7 important that the incentives that the
08:47:52 8 governments provide be structured appropriately.
08:47:56 9 And as Dr. Bull pointed out, there has been for
08:47:58 10 nearly 20 years now a production tax credit.
08:48:02 11 Unfortunately, that's largely been geared toward
08:48:04 12 for-profit entities like investor-owned electric
08:48:06 13 utilities and has not been available for
08:48:08 14 not-for-profit electric cooperatives, for
08:48:10 15 municipal systems, and others.

08:48:12 16 And we've only had a comparable program
08:48:14 17 called the Clean Renewable Energy Bonds Program,
08:48:16 18 or CREB program, for a little over two years.
08:48:18 19 And encouraging Congress to support extension of
08:48:22 20 that CREB program as they work to extend the PTC
08:48:26 21 program is an important element of making these
08:48:30 22 renewable resources financially and economically
08:48:32 23 viable for member consumers.

08:48:36 24 So while people talk about the PTC from
08:48:40 25 the not-for-profit sector which is largely made

08:48:40 1 up of the consuming cooperatives and
08:48:44 2 municipalities of the TVA system, it's important
08:48:44 3 to look to that CREB program. And I believe
08:48:46 4 that there were CREB bonds awarded to
08:48:52 5 cooperatives in the Tennessee Valley area here.

08:48:54 6 The other element that really cannot be
08:48:58 7 overlooked when discussing renewable resources
08:49:00 8 or really any energy supply resources is the
08:49:04 9 need to keep the transmission system up to date
08:49:06 10 with the development of those resources, whether
08:49:08 11 it's natural gas peaking unit, wind resources,
08:49:10 12 or landfill gas. You need to be able to get
08:49:12 13 that electricity from that resource to the
08:49:16 14 consuming public that needs it. And so keeping
08:49:20 15 in mind and helping keep the government in mind
08:49:22 16 and the public in mind of the need to develop
08:49:26 17 additional transmission capacity to move that
08:49:28 18 power from where the resources are to where the
08:49:30 19 load is is a critically important component and
08:49:32 20 you can't talk about renewable policy and
08:49:36 21 renewable goals without also thinking about the
08:49:40 22 transmission necessary to accomplish the
08:49:42 23 objective.

08:49:42 24 You may have great renewable resources
08:49:44 25 in a particular area, but if the cost of

08:49:46 1 building the transmission to get those
08:49:48 2 renewables to the loads or to connect it to the
08:49:52 3 rest of the grid becomes prohibitive, then
4 effectively those renewable resources are really
08:49:58 5 not there. And so keeping in mind that
08:49:58 6 component is essential.

08:50:00 7 The last thing I want to mention and
08:50:02 8 may be of significant interest to the TVA Board
08:50:04 9 and the cooperatives that you serve that we
08:50:06 10 represent is that development of a national
08:50:08 11 renewable energy cooperative that a number of
08:50:12 12 generation transmission cooperatives around the
08:50:18 13 country working with NRECA are in the process of
08:50:20 14 developing. We call it the NRCO, for lack of a
08:50:20 15 better name, the National Renewable Cooperative.

08:50:22 16 And this is an effort where
08:50:24 17 cooperatives around the country are banding
08:50:26 18 together to create a new entity that will help
08:50:28 19 them develop and deliver cost effective
08:50:32 20 renewable resources to cooperatives around the
08:50:36 21 country who want to participant in this new
08:50:38 22 national renewable cooperative.

08:50:40 23 The guiding principles of the national
08:50:44 24 cooperative are to commit to utilize
08:50:50 25 economically viable, proven renewable energy

08:50:52 1 resources for all interested rural electric
08:50:54 2 cooperatives, to apply the cooperative
08:50:56 3 principles to maximize the benefits of those
08:50:56 4 renewables to rural electric consumer members
08:51:02 5 and to assist the cooperatives in their efforts
08:51:02 6 to meet renewable energy, either goals that the
08:51:04 7 cooperatives have set or legal requirements that
08:51:08 8 may come from states or the Federal government
08:51:10 9 in terms of a renewable portfolio standard.

08:51:14 10 We think this is a very exciting
08:51:16 11 development that is going on around the country.
08:51:18 12 Information on the business development plan has
08:51:24 13 been very recently distributed to all
08:51:26 14 cooperatives around the country and it's right
08:51:28 15 now in the process of getting formed, where
08:51:32 16 cooperatives have been invited to participate.
08:51:34 17 Cooperatives will have to make decisions about
08:51:36 18 whether they want to financially participate at
08:51:38 19 the beginning and then move into this new
08:51:42 20 program. It will require some financial dollars
08:51:46 21 up front to become engaged and become an early
08:51:50 22 actor. But the early actors will be the ones
08:51:52 23 eligible to participate on the board of
08:51:54 24 directors of this new national renewable
08:51:58 25 cooperative.

08:53:00 25 So we think this is an excellent way to

08:53:02 1 try to utilize that cooperative principle of
08:53:06 2 cooperation among cooperatives to come together
08:53:08 3 to jointly develop the most cost effective
08:53:12 4 resources that are possible out there on behalf
08:53:14 5 of the membership. So this process is, as I
08:53:20 6 said, just getting going. As I said, the
08:53:22 7 business plan is designed to ensure affordable
08:53:26 8 participation by cooperatives around the country
08:53:28 9 to allow for somewhat rapid development and
08:53:32 10 formation of the legal entity, which has now
08:53:34 11 been done, to minimize the cost and risk to
08:53:38 12 individual cooperatives by pooling that cost and
08:53:40 13 risk across a wide array of cooperatives.

08:53:44 14 Right now nationwide we have about 750
08:53:48 15 cooperatives that offer some form of renewable
08:53:50 16 energy resources to their member consumers.
08:53:52 17 That includes wind, hydro, et cetera. This will
08:53:54 18 be another opportunity for cooperatives to meet
08:53:56 19 their member consumers' needs and may be
08:53:58 20 something that will be helpful to the TVA system
08:54:00 21 in terms of helping meet your objectives to
08:54:04 22 develop renewable energy resources.

08:54:06 23 I can't say for sure whether or not
08:54:08 24 that will be the case. That will have to be
08:54:08 25 decided by your cooperatives and how exactly

08:54:10 1 that will relate to the Tennessee Valley
08:54:14 2 Authority as an entity, I can't speak to that at
08:54:18 3 this point because it is a little bit of a legal
08:54:20 4 question that will have to be resolved in this
5 transmis -- transition period as this new entity
6 is being developed.

08:54:24 7 So with that, I want to thank you again
08:54:26 8 for the invitation and look forward to answering
08:54:28 9 any questions you or others might have
08:54:30 10 throughout this panel discussion. Thank you
08:54:32 11 very much.

08:54:32 12 MR. FRANCIS: Thank you, Mr. Johnson.
08:54:34 13 Commissioner Sloan is our next speaker.

08:54:36 14 COMMISSIONER SLOAN: Yes, Mr. Chairman
08:54:38 15 and members of the Board. I again want to thank
08:54:40 16 you for including me in this discussion and also
08:54:42 17 repeat what I said yesterday in how much I
08:54:46 18 appreciate your management team that you have
08:54:48 19 tasked with developing the efficiency and
08:54:54 20 renewable portion of your strategic plan. I
08:54:54 21 don't think you could have a better group of
08:54:56 22 individuals working on the project.

08:54:58 23 I also want to commend you and say how
08:55:04 24 much I appreciate the depth and expertise of the
08:55:06 25 panelists that you have -- that you have

08:55:10 1 gathered here. I think it underscores the
08:55:14 2 resources that are willing and --willing and
08:55:18 3 enthusiastic about supporting you in the
08:55:20 4 development of the strategic plan.

08:55:24 5 As you develop the renewable energy
08:55:28 6 strategic plan, I again encourage you to also
08:55:30 7 identify the specific areas in which the State's
08:55:32 8 support and partnership can help maximize
08:55:36 9 renewable generation. I also encourage you to
08:55:40 10 take the initiative and consider the possibility
08:55:44 11 of jointly developing with us a renewable
08:55:50 12 portfolio standard. I think there could be a
08:55:52 13 great advantage to our taking the initiative and
08:55:54 14 I think that could send an important signal not
08:55:58 15 only throughout the Valley but to Washington.
08:56:04 16 As Stan observed, there are 24 states with
08:56:06 17 renewable portfolio standards. North Carolina
08:56:10 18 and I understand others in the Valley are
08:56:14 19 considering them.

08:56:16 20 If you were to do so, it's my view that
08:56:20 21 the renewable portfolio standard should include
08:56:24 22 the ability to meet that standard in part by
08:56:26 23 energy efficiency. It also is my view that we
08:56:32 24 should look at the definition of what renewables
08:56:34 25 are includable in those renewables and perhaps

08:56:40 1 be guided by Stan's definition of those sources
08:56:42 2 that are not depleted by human use but something
08:56:46 3 that we would want to look at closely.

08:56:48 4 With respect to the existing volunteer
08:56:52 5 program, the Green Power Switch Program, were
08:56:56 6 you to look at and were we to develop a
08:57:00 7 renewable portfolio standard, it's my view that
08:57:04 8 that should be integrated not as a -- not as a
08:57:06 9 credit but as an addition to. It doesn't make
08:57:10 10 any sense to me to have volunteer participants
08:57:12 11 actually paying for renewables that would be
08:57:14 12 includable in the portfolio standard.

08:57:22 13 Logic would suggest that in order to
08:57:24 14 maximize renewables, all feasible alternatives
08:57:26 15 should be explored. And given that there is no
08:57:30 16 single dominant source or method of renewable
08:57:34 17 generation, particularly here in Tennessee, the
08:57:36 18 renewable component will need to be the total of
08:57:40 19 a very diverse set of components. These, I
08:57:46 20 hope, would include, number one, your
08:57:48 21 continuation and expansion of the Generation
08:57:52 22 Partners Program. In addition, I would love --
08:57:58 23 I would recommend you consider the expansion of
08:58:02 24 the distributed generation of renewable power
08:58:06 25 developed by both third parties and yourself. I

08:58:10 1 really think this is an area that is -- it is an
08:58:12 2 opportunity -- opportunity for Valley-wide
08:58:14 3 research and development and to implement many
08:58:18 4 of the numerous and increasing diverse
08:58:24 5 technologies, some of which Kirk Johnson just
08:58:28 6 mentioned.

08:58:28 7 Thirdly, I think and recommend that you
08:58:32 8 have a close look at the feasibility also of
08:58:36 9 adding large commercial scale renewable
08:58:40 10 generation facilities, whether wind or solar
08:58:44 11 generation or both. And, finally, to fully
08:58:50 12 exploit the opportunities of combined heat and
08:58:52 13 power to maximize the energy outputs and also to
08:58:56 14 look at opportunities to combine with
08:59:02 15 co-generation the use of biomass as a part and
08:59:08 16 integrated with those facilities.

08:59:10 17 In evaluating renewables, I further
08:59:12 18 encourage you to fully -- to fully account for
08:59:14 19 the externalized costs as well as the direct
08:59:18 20 costs of the alternatives. The technology
08:59:20 21 surrounding renewable generation is rapidly
08:59:24 22 improving, as Stan pointed out, while the cost
08:59:28 23 and the environmental impacts of the
08:59:32 24 alternatives are likewise increasing.

08:59:34 25 As you well know, the drought this past

08:59:38 1 year has had a significant impact on power
08:59:40 2 generation, underscoring and uncertain future
08:59:46 3 availability of our water and river resources to
08:59:48 4 fully support not only the existing generation
08:59:52 5 capacity but as well as the non-renewable new
08:59:58 6 power generation.

09:00:02 7 Finally, in addition, tightening Clean
09:00:06 8 Air Act, National Ambient Air Standards for
09:00:10 9 ozone and small particulate matter plus regional
09:00:16 10 haze requirements as well as the recent D. C.
09:00:18 11 District Court's invalidation of the Clean Air
09:00:20 12 Mercury Rule, all support the wisdom of
09:00:22 13 significantly increasing the renewable portion
09:00:24 14 of TVA's power generations.

09:00:28 15 For the same reasons, as well as the
09:00:30 16 potential for the economic development
09:00:34 17 opportunities for Tennessee and the surrounding
09:00:38 18 states, in support of the emergence of clean and
09:00:40 19 renewable industry, I return to my initial
09:00:44 20 request for you to identify and recommend ways
09:00:48 21 in which the State can best support you in this
09:00:54 22 substantial expansion of TVA's renewable energy
09:00:58 23 regeneration. Thank you.

09:00:58 24 MR. FRANCIS: Thank you, Commissioner
09:01:00 25 Sloan. Mr. William will be the final panelist

09:01:04 1 to offer comment on the policy panel.

09:01:06 2 Mr. William.

09:01:10 3 MR. WILLIAMS: Good morning. I would
09:01:10 4 like to thank the Board, first of all, for
09:01:12 5 allowing me this opportunity to participant on
09:01:14 6 this panel and to discuss this very important
09:01:16 7 issue. The American Public Power Association
09:01:18 8 which I represent today has always had a good
09:01:22 9 working relationship with TVA and we look
09:01:24 10 forward to continuing that relationship with you
09:01:26 11 as you move forward in your objectives on this
09:01:28 12 issue.

09:01:28 13 APPA is a national service organization
09:01:32 14 representing the interest of over 2,000 state-
09:01:34 15 and locally-owned electric utilities nationwide
09:01:38 16 that collectively serve over 44 million
09:01:42 17 Americans. Given their nature as community-
09:01:44 18 owned utilities, governed at the local level and
09:01:46 19 directly accountable to citizens they serve,
09:01:50 20 public power systems continue to demonstrate a
09:01:52 21 high degree of commitment to environmental
09:01:54 22 stewardship and to addressing environmental
09:01:58 23 concerns. Excuse me.

09:02:00 24 The public power question of whether or
09:02:02 25 not Congress should enact a Federal mandatory

09:02:06 1 renewable portfolio standard is extremely
09:02:06 2 challenging. APPA strongly supports the
09:02:10 3 development of energy from renewable sources,
09:02:14 4 however, APPA does not support a Federal mandate
09:02:18 5 for a renewable portfolio standard also known as
09:02:20 6 an RPS. We believe this is an issue that should
09:02:24 7 be handled at the state and local levels and
09:02:26 8 states and localities have been acting
09:02:30 9 aggressively to develop more renewable energy.

09:02:30 10 As mentioned earlier, currently 24
09:02:34 11 states have a mandatory renewable portfolio
09:02:40 12 standard with Illinois, Missouri, Virginia and
09:02:44 13 Vermont having nine bonding goals for adapting a
09:02:46 14 renewable energy instead of an RPS. The Oregon
15 legislator -- legislature, excuse me, has also
09:02:52 16 recently approved an aggressive standard, as
17 well.

09:02:54 18 Because each state has a different mix
09:02:56 19 of renewable sources, state statutes vary from
09:02:58 20 state to state and, thus, the standards that
09:03:00 21 they set are based on their own unique
09:03:04 22 circumstances. This must be considered in any
09:03:06 23 approach that you take. This fact is precisely
09:03:10 24 why we cannot at APPA support a Federal mandate.
09:03:14 25 Such a mandate would ignore those variations and

09:03:16 1 resources and create winners and losers among
09:03:18 2 the states and among different renewable
09:03:22 3 technologies as well as winners and losers among
09:03:24 4 our membership.

09:03:24 5 In addition to state RPS programs, some
09:03:28 6 public power systems have also established their
09:03:30 7 own RPS requirements. For example, in 2005 the
09:03:34 8 citizens of Columbia, Missouri, passed an RPS
09:03:40 9 requirement for their utility, Columbia Water
09:03:42 10 and Light, of 2 percent in 2008, 5 percent in
09:03:44 11 2012, 10 percent in 2017, and 15 percent in
09:03:54 12 2022. Columbia Water and Light serves over
09:03:58 13 38,000 customers and is the first utility in
09:04:02 14 Missouri to have an RPS. I would also note that
09:04:04 15 we have some members that also have self-imposed
09:04:06 16 RPSs, for example, Sandy Cooper in South
09:04:10 17 Carolina and JEA in Jacksonville Florida.

09:04:14 18 APPA's opposition to a Federal
09:04:16 19 renewable energy portfolio standard should not
09:04:18 20 be interpreted as a lack of support for taking
09:04:20 21 the maximum advantage possible of our renewable
09:04:24 22 resources. Evidence of public powers'
09:04:26 23 commitment to renewable energy resources is
09:04:28 24 apparent from the fact that in 2005 public power
09:04:32 25 utilities were among the highest ranked

09:04:36 1 utilities of all types offering green power
09:04:38 2 programs nationally, according to the Department
09:04:42 3 of Energy's National Renewable Energy
09:04:44 4 Laboratory.

09:04:44 5 Green power refers to green pricing
09:04:46 6 programs under which a utility sells power from
09:04:50 7 renewable or environmentally friendly energy
09:04:54 8 sources. Austin Energy located in Austin,
09:04:56 9 Texas, led the nation in the amount of green
09:05:00 10 power sold in 2004. Sacramento Municipal
09:05:04 11 Utility District and LAPW -- excuse me -- LADWP
09:05:10 12 in California were also among the top five in
09:05:12 13 total number of customer participants.

09:05:14 14 I would also like to note that APPA
09:05:20 15 believes that a mandatory legislation to require
09:05:22 16 reduction in greenhouse gases in order to
09:05:24 17 address the problem of global warming is
09:05:26 18 inevitable. Therefore, a national RPS program
09:05:30 19 adopted today in an effort to reduce greenhouse
09:05:32 20 gas emissions would be redundant when Congress
09:05:36 21 also enacts a mandatory program to achieve the
09:05:38 22 same purpose. Requiring utilities to meet both
09:05:40 23 the RPS requirement and mandatory reductions of
09:05:44 24 greenhouse gas emissions would, in fact, amount
09:05:46 25 to a double whammy, placing a significantly

09:05:48 1 greater burden on electric utilities relative to
09:05:52 2 other sectors of the economy. If you were to
09:05:54 3 address the problem of global warming, and APPA
09:06:00 4 believes that we should, we should do so in a
09:06:00 5 way that does not contribute to the problem and
09:06:04 6 will be responsible for a proportion
09:06:08 7 contribution to the solution.

09:06:10 8 Before closing, in recent history it
09:06:14 9 has been shown that there is a strong and
09:06:16 10 growing support for increased energy production
09:06:18 11 from renewable and clean energy resources.
09:06:20 12 Congress has consistently provided privately-
09:06:24 13 owned energy companies with tax code based
09:06:26 14 incentives for such investments, which has been
09:06:30 15 discussed by Kirk. For example, Section 45 of
09:06:36 16 the production tax credit, not-for-profit public
09:06:40 17 power systems and rural electric cooperatives
09:06:42 18 which together serve 25 percent of America's
09:06:44 19 electric customers have sought and will continue
09:06:50 20 to seek comparable incentives for this type of
09:06:52 21 development.

09:06:52 22 Closely related to that is the fact
09:06:54 23 that the Renewable Energy Production Incentive,
09:07:00 24 also known as the REPI program, was created in
09:07:00 25 1992 to provide a comparable incentive to

09:07:04 1 produce renewable energy for these not-for-
09:07:06 2 profit electric utilities, but it depends on
09:07:10 3 annual appropriations and has never received
09:07:14 4 significant funds to achieve this objective.
09:07:14 5 Today the demand for the program has far
09:07:18 6 outpaced the funding. REPI has been and remains
09:07:20 7 a valuable program, but it cannot meet the needs
09:07:24 8 of all not-for-profit utilities seeking to
09:07:28 9 promote the use of renewable energy. And the
09:07:30 10 problem for these utilities is becoming more
09:07:32 11 acute as states adopt renewable portfolio
09:07:38 12 standards.

09:07:38 13 I would note that the administration's
09:07:40 14 2009 budget zeroed out funding for the REPI
09:07:44 15 program. Historically the program has received
09:07:48 16 around \$5 million, which as we know is
09:07:48 17 significantly underfunded, but the fact that the
09:07:50 18 administration zeroed out the program in its '09
09:07:52 19 budget is very much a problem for APPA and we
09:07:56 20 continue to lobby and will continue to lobby to
09:08:00 21 get funding back into that program at a
09:08:02 22 significant level.

09:08:04 23 Congress also sought to address this
09:08:06 24 situation by, as Kirk mentioned also, enacting
25 the Clean Renewable Energy Bond, CREB, program

09:08:12 1 in the Energy Policy Act of 2005. Under this
09:08:16 2 program, public power systems and rural electric
09:08:20 3 cooperatives have a financial incentive somewhat
09:08:22 4 comparable to the production tax credit provided
09:08:24 5 to for-profit companies. Combined with
09:08:28 6 continued funding for REPI, the CREB program
09:08:30 7 will enable a broader swath of not-for-profit
09:08:34 8 electric sectors to invest in these cleaner
09:08:40 9 technologies.

09:08:40 10 Before closing, I would just note
09:08:42 11 that on Friday of last week, the House of
09:08:44 12 Representatives passed HR 5351 which is the
09:08:50 13 Renewable Energy and Energy Conservation Tax Act
09:08:54 14 of 2008. This energy tax bill approved by the
09:08:56 15 House includes an APPA supported provision that
09:09:00 16 creates a new category of clean, renewable
09:09:02 17 energy bonds called New CREBs and provides, in
09:09:06 18 additional, a national all allocation invitation
09:09:10 19 or the New CREBs of \$2 billion.

09:09:14 20 The New CREB Program includes a
09:09:16 21 category defined as public power provider and
09:09:18 22 would divide the 2 billion allocation authority
09:09:22 23 between projects of public power providers and
09:09:24 24 rural electric cooperatives only. Public power
09:09:26 25 is to receive 60 percent of the national volume

09:09:30 1 cap and rural electric cooperatives are to
09:09:32 2 receive 40 percent of the national volume cap.

09:09:34 3 The bill does not include a sunset
09:09:38 4 provision for the program. The current law does
09:09:40 5 and that would expire in 2008, at the end of
09:09:44 6 2008 of this year. And, also, as mentioned
09:09:46 7 earlier, the bill also includes language
09:09:48 8 supported by APPA on plug-in electric hybrid
09:09:54 9 vehicles which we think is also an issue that
09:09:58 10 needs to be addressed in terms of looking at
09:09:58 11 solutions to renewables.

09:10:00 12 So with that, I will conclude and look
09:10:02 13 forward to answering any questions that the
09:10:04 14 Board and the public may have. Thank you.

09:10:06 15 MR. FRANCIS: Thank you, Mr. Williams.
09:10:06 16 At this time the Board may have questions of the
09:10:10 17 panel.

09:10:12 18 MR. BOTTORFF: Questions? Let me ask
09:10:12 19 you a question then, Dr. Williams. I was
09:10:20 20 interested in your chart, Dr. Bull, that you
09:10:26 21 showed how investments have reduced the cost of
09:10:30 22 renewables. My understanding is that we still
09:10:34 23 don't have the cost down there to really be
09:10:38 24 fully competitive with conventional production
09:10:42 25 generation capabilities.

09:10:44 1 DR. BULL: Yes.

09:10:46 2 MR. BOTTORFF: And so, Dr. Williams,
09:10:46 3 what I'm thinking about is if we look in this
09:10:50 4 country and we see that basically a lot of
09:10:52 5 research that's been done that's produced really
09:10:56 6 effective results has been funded by Government
09:11:00 7 through NIH and other sources like that and
09:11:00 8 that's appropriate public policy and I'm
09:11:04 9 reading, you know, about maybe investment --
09:11:06 10 incentives that are being done for for-profit
09:11:10 11 public -- for-profit power companies and I'm
09:11:14 12 kind of wondering, does the American Public
09:11:18 13 Power Association have any ideas about how the
09:11:20 14 not-for-profits can participate in those kinds
09:11:26 15 of government incentives that would cause us to
09:11:28 16 put dollars into research to keep that curve,
09:11:32 17 Mr. Bull, going down for cost of renewables?
09:11:36 18 Have you all talked anything about that in your
09:11:38 19 association, about how public power companies
09:11:40 20 might be included in that kind of legislation to
09:11:44 21 encourage us to make investments that would
09:11:46 22 drive down that cost, as well?

09:11:50 23 MR. WILLIAMS: Well, we haven't had any
09:11:52 24 talks about how the not-for-profits can be
09:11:56 25 included in this legislation that the

09:11:58 1 for-profits are included in. However, what we
09:12:00 2 have focussed on, as I mentioned in my written
09:12:02 3 remarks, are programs such as the REPI program
09:12:06 4 and the CREBS program. We believe these are
09:12:08 5 very comparable programs to the type of funding
09:12:12 6 that the for-profits receive. And we've been
09:12:14 7 working very hard, particularly on the CREBS
09:12:16 8 program, to increase the funding for that
09:12:20 9 program and then obviously to do away with any
09:12:24 10 sunset provisions that may be included in such
09:12:26 11 legislation.

09:12:28 12 Now, obviously the House has passed, I
09:12:30 13 believe, this particular CREB legislation twice.
09:12:34 14 The legislation has failed on several occasions
09:12:38 15 in the Senate. The reason being there, it's
09:12:42 16 very -- included within this CREB legislation is
09:12:44 17 also legislation that would take the tax
09:12:48 18 benefits from the oil industry, so it's always a
09:12:52 19 very contiguous issue in the Senate. But we
09:12:56 20 believe that with the change, possible change in
09:12:58 21 the administration and new dynamics forming
09:13:00 22 themselves in Washington, that that could be
09:13:04 23 coming to an end and then we will be able to
09:13:06 24 move forward and get this legislation through.

09:13:12 25 MR. BOTTORFF: Other questions?

09:13:12 1 MR. SANSOM: Stan, I know you've said
09:13:14 2 you don't want to get technical, but I'm going
09:13:14 3 to go with you. Tell me about some of the
09:13:18 4 geothermal success stories. And I know you made
09:13:20 5 the comment we weren't in the right place. I do
09:13:24 6 understand that maybe a little bit in
09:13:24 7 Mississippi, maybe a little bit over there in
09:13:28 8 edge of Arkansas we might have some potential.
09:13:30 9 But I'd just like to hear what's going on.

09:13:32 10 DR. BULL: Well, with current
09:13:34 11 technology, it's mainly a Western resource.
09:13:36 12 It's not deep drilling and it's -- you bring
09:13:42 13 either steam or hot water. It's a brine
09:13:44 14 usually. It's got a lot of nasty stuff in it.
09:13:46 15 But, nevertheless, it works. And it's been a
09:13:48 16 very steady -- there's been very little growth
09:13:52 17 over the past 10, 15 years, primarily because
09:13:56 18 they're unable to really take advantage of the
09:14:00 19 production tax credit because of the time frame
09:14:02 20 under which they have to function.

09:14:04 21 It takes a long time to develop a
09:14:08 22 geothermal site. You have to explore, just like
09:14:08 23 looking for oil, for example. And the DOE
09:14:14 24 program has been a bit on a roller coaster. It
09:14:16 25 is starting to come back and they're looking

09:14:18 1 toward the future now, very much toward the
09:14:20 2 future, as what I call enhanced geothermal
09:14:24 3 systems. And that primarily means -- we used to
09:14:28 4 call it hot dry rock. You drill down deep
09:14:30 5 enough to where there's a lot of hot dry rock.
09:14:32 6 You have to put a fluid to that, but then you
09:14:34 7 can actually put it into a closed loop. And
09:14:36 8 that could open up a much larger portion of the
09:14:40 9 United States to accessing geothermal as we
09:14:42 10 learn more and more -- we learned this from the
09:14:44 11 oil industry, you know, how to drill, how to
09:14:46 12 drill effectively, how to drill new horizontal
09:14:50 13 drilling, et cetera.

09:14:50 14 And so there could be a future -- there
09:14:52 15 could be a future for geothermal, but don't
09:14:56 16 count on it in the next 10 to 15 years, for
09:14:58 17 sure.

09:15:04 18 MR. THRAILKILL: I, too, have a
09:15:04 19 question for Mr. Bull. You mentioned during
09:15:06 20 your comments that the new generation of wind
09:15:12 21 turbines can tap -- may change the profile of
09:15:16 22 what we have available here to tap. I have a
09:15:20 23 couple of questions.

24 MR. BULL: Sure.

09:15:20 25 MR. THRAILKILL: One, how does it

09:15:22 1 change it? And, two, if you include with or
09:15:26 2 without carbon capture, when do you see that
09:15:28 3 technology crossing over and being economically
09:15:32 4 comparative to some of the fossil regeneration
09:15:34 5 we have in place today?

09:15:36 6 DR. BULL: The wind industry has grown
09:15:38 7 in scale and size of the wind turbines and very
09:15:42 8 dramatically. They have way outstripped our
09:15:44 9 projections of how rapidly they -- how big they
09:15:48 10 would get in the size. And what I -- they are
09:15:48 11 currently -- the current generation is 2.5
09:15:52 12 megawatts, but they're looking to 3 and going on
09:15:54 13 up to 5 megawatts.

09:15:56 14 Generally what that means to do that is
09:15:58 15 you put them on taller towers and then the
09:16:02 16 blades are even longer. And we're looking at
09:16:04 17 things the size -- the height of a football
09:16:06 18 field on a tower and then a football field up on
09:16:10 19 top of that tower spinning. So it's an enormous
09:16:14 20 operation.

09:16:14 21 What that does is it puts the hub of
09:16:16 22 the wind turbine up into a much higher wind
09:16:20 23 regime. The winds get high -- greater as you go
09:16:24 24 up further from the Earth. Which there are
09:16:26 25 surfaces causing turbulence and resistance to

09:16:30 1 that wind. So whereas at a hub height of
09:16:34 2 50 meters you may not be competitive, but at 100
09:16:38 3 meters or 150 meters, then you start to get into
09:16:42 4 wind regimes that could be cost competitive if
09:16:44 5 we can build those and erect them at roughly the
09:16:46 6 same kind of cost that we can the smaller
09:16:48 7 turbine. And we're finding that -- the industry
09:16:52 8 is finding that there is a cost advantage to
09:16:54 9 making them larger in general as long as you
09:16:58 10 don't just make them heavier and bigger and
09:17:00 11 bulkier. You have to be smart about it. So
09:17:00 12 that's where the technology development is
09:17:02 13 coming in. How do you make very long blades
09:17:06 14 that are very robust and structurally sound but
09:17:10 15 at the same time lighter and lighter and
09:17:12 16 lighter. And that comes in new materials and
09:17:14 17 how you fabricate them.

09:17:18 18 MR. THRAILKILL: The second part of my
09:17:20 19 question was when do you see -- do you see the
09:17:22 20 cost curve continuing to climb with that class
09:17:22 21 of equipment?

09:17:22 22 DR. BULL: Our target is 2012 for wind
09:17:26 23 turbines like that.

09:17:30 24 MR. THRAILKILL: To reach parity?

25 DR. BULL: I'm sorry?

09:17:30 1 MR. THRAILKILL: To have that class of
09:17:32 2 turbine or --

09:17:32 3 DR. BULL: Yeah, to have that type of
09:17:34 4 turbine.

09:17:36 5 MR. THRAILKILL: But when do you see
09:17:38 6 its production costs equaling --

09:17:40 7 DR. BULL: Well, we're talking -- the
09:17:42 8 goal is 3 -- about 3 and a half cents, 3.6, you
09:17:46 9 know -- don't ask me why 3.6 -- by 2012, which
09:17:50 10 with -- should be cost competitive without the
09:17:52 11 production tax credit.

09:17:58 12 MR. FRANCIS: We have time for one more
09:17:58 13 question.

09:18:02 14 MR. BOTTORFF: Mr. Johnson, I didn't
09:18:04 15 quite follow the legal entity of, I'm going to
09:18:08 16 call it, joint venture, for lack of a better
09:18:10 17 term, that you're talking about among
09:18:14 18 cooperatives. Is the purpose of that R & D,
09:18:18 19 like Mr. Bull was talking about, or is the
09:18:20 20 purpose of that to locate renewable sources in
09:18:24 21 places where we already know that they are cost
09:18:28 22 competitive and then to export that to different
09:18:32 23 places? I wasn't quite sure what the primary
09:18:34 24 purpose of that entity is.

25 MR. JOHNSON: The purpose of the

09:18:38 1 national renewable cooperative is to facilitate
09:18:38 2 development of renewable resources. It's not to
09:18:40 3 be a research/development type of entity. It is
09:18:42 4 to be, as you said, a joint venture operation
09:18:46 5 where people can or cooperatives can come
09:18:48 6 together, participate in a project. The staff
09:18:50 7 of the new cooperative will be dedicated to
09:18:56 8 going out and finding the best, most cost
09:19:00 9 effective projects available, partnering with
09:19:02 10 those developers, whether it's a John Deere wind
09:19:06 11 farm or an FP&L wind farm or a geothermal
09:19:08 12 resource or whatever it might be and then
09:19:12 13 offering that project to cooperatives and
09:19:14 14 whichever cooperatives want to participate in
09:19:16 15 that project, they would then, again, be able to
09:19:18 16 benefit their proportionate share of the output,
09:19:22 17 both the energy output -- potentially the energy
09:19:24 18 output and the green tag output of that project.

09:19:28 19 So it's designed to be an opportunity
09:19:30 20 for cooperatives to pool together, share that
09:19:32 21 risk, share the burden, and find the most cost
09:19:38 22 effective renewable resources possible, wherever
09:19:38 23 they may be.

09:19:42 24 MR. BOTTORFF: Thank you. Gil, the
09:19:44 25 Chairman wants to ask another question. I think

09:19:46 1 he's got that right.

2 MR. FRANCIS: Absolutely.

09:19:48 3 MR. SANSOM: Paul, what's the State

09:19:50 4 doing on K through 12 conservation in the

09:19:54 5 schools? Have y'all got something going?

09:19:58 6 COMMISSIONER SLOAN: There's a bill

09:19:58 7 currently making its way through -- it's not an

09:20:04 8 administration bill, but it's a very interesting

09:20:04 9 one -- and it would take some of the lottery,

09:20:08 10 allocated lottery monies and put it in and fund

09:20:12 11 the capital investment of school districts to

09:20:16 12 invest in energy efficiency, which pays for

09:20:20 13 itself. It's the front-end capital that's the

09:20:24 14 problem. So it's an interesting approach and

09:20:28 15 it's one that I think we all ought to follow.

09:20:32 16 If that doesn't pass, I think that from

09:20:32 17 the administration's point of view that I could

09:20:34 18 see it being a component of what develops as the

09:20:40 19 policy. As I said, one of the interesting

09:20:46 20 things is it's a perpetual fund. Once you lend

09:20:50 21 it out, then it pays back. Sullivan County is

09:20:52 22 one of those counties that has done county-wide

09:20:56 23 implementation of energy efficiency, including

09:21:00 24 geothermal and others, which I can't remember

09:21:04 25 the numbers now. It seemed to me it was several

09:21:08 1 million dollars' investment that in the end paid
09:21:10 2 for not only itself but paid for their computers
09:21:14 3 in their school systems. I mean it's a very
09:21:16 4 successful program that needs to be scaled out.

09:21:20 5 MR. SANSOM: Since we've got the
09:21:20 6 chairman of the lottery sitting right here, do
09:21:24 7 you want us to talk to him about the money?

09:21:28 8 MR. FRANCIS: Thank you, everyone.

9 COMMISSIONER SLOAN: We need that
10 money.

09:21:32 11 MR. FRANCIS: This concludes the policy
09:21:32 12 panel. We'll take just a moment to change out
09:21:34 13 the panels. Once again, thank you to all the
09:21:36 14 members of the panel for their comments today.

09:21:40 15 (A break was taken.)

09:24:46 16 MR. BOTTORFF: Gil, before you
09:24:48 17 introduce the panel, I want to recognize Susan
09:24:50 18 Williams who is -- who has served on this Board
09:24:52 19 and who has been nominated by the President to
09:24:52 20 do so once again and it shows how much she cares
09:24:56 21 about TVA to be here participating in these
09:24:58 22 sessions. Susan, thank you for coming out
09:25:00 23 today.

24 MR. THRAILKILL: Hear. Hear.

09:25:02 25 MS. WILLIAMS: Thank you.

09:25:04 1 MR. FRANCIS: Our next panel will
09:25:06 2 focus on environmental aspects of renewables.
09:25:06 3 Members of this panel, from left to right,
09:25:08 4 Dr. Burton English, Professor of Agricultural
09:25:12 5 Economics at the University of Tennessee,
09:25:14 6 Department of Agricultural Economics; Ed Holt,
09:25:20 7 President, Ed Holt and Associates, Incorporated;
09:25:22 8 John Wilson, Director of Research at the
09:25:24 9 Southern Alliance for Clean Energy; and Meredith
09:25:30 10 Wingate, Director of Clean Energy, Policy,
09:25:32 11 Design and Implementation at the Center for
09:25:32 12 Resource Solutions. Dr. English.

09:25:36 13 DR. ENGLISH: Thank you very much for
09:25:38 14 inviting me and just a little bit about me.
09:25:42 15 Thank you. I've been working in the area of --
09:25:50 16 in this area of using biomass for energy since
09:25:54 17 1978, first using corn residues in Iowa power
09:26:00 18 plants. We have a lot of projects in the
09:26:06 19 Department of Agricultural Economics. I'm
09:26:12 20 summarizing about four of them in this piece.
09:26:16 21 The fact that I'm an economist means that when
09:26:20 22 you talk about environment, it has to be
09:26:22 23 economically sustainable as well and so
09:26:24 24 economics and environment are spread throughout
09:26:28 25 the presentation.

09:26:34 1 I'm going to discuss several studies, a
09:26:36 2 co-firing study that we did for the Southeast
09:26:38 3 part of the country, the SERC region. An
09:26:44 4 emissions analysis that I currently have about
09:26:48 5 122 acres of switch grass growing in West
09:26:52 6 Tennessee and in conjunction with Southern Power
09:26:56 7 and TVA, we are co-firing that at Gadsden,
09:27:02 8 Alabama, and we ran some emissions tests that
09:27:04 9 were dependent on harvest time and I want to
09:27:06 10 bring some of that information to your
09:27:08 11 attention. We've conducted an employment study.
09:27:14 12 If RPS was enabled in the region, what would be
09:27:20 13 the impact on employment as a result of that
09:27:24 14 within TVA -- within the TVA region. And then
09:27:28 15 finally we've conducted two surveys, a green
09:27:30 16 power survey of Tennessee customers looking at
09:27:34 17 biomass, adding biomass to the portfolio of
09:27:38 18 renewable feed stocks, as well as the farmer's
09:27:42 19 willingness to grow this stuff.

09:27:46 20 In a recent analysis that we conducted
09:27:48 21 for 25 by 25, we found that the area spanning
09:27:54 22 from the Virginia coast to Oklahoma will be
09:27:56 23 extremely valuable in meeting renewable fuel and
09:28:00 24 electricity needs from biomass resources. And
09:28:02 25 the map that you see before you, I think, shows

09:28:06 1 this. The dark areas are the areas that I'm
09:28:08 2 talking about significant quantities of biomass
09:28:12 3 will be required, both for liquid fuels as well
09:28:16 4 as electricity.

09:28:22 5 Biomass feedstocks that we've included
09:28:26 6 in our analysis, include agricultural residues,
7 dedicated energy crops, forest residues, urban
8 wood waste, wood mill wastes as well as
09:28:34 9 livestock waste in some of our studies. These
09:28:38 10 wastes typically have lower emission levels of
09:28:44 11 sulfur or sulfur compounds. Can potentially
12 reduce nitrogen oxide emissions, although the --
09:28:50 13 we don't know that for sure yet, I don't
09:28:54 14 believe.

09:28:54 15 The commission -- the system of growing
09:28:58 16 biomass crops and using them as a feedstock for
09:29:00 17 energy generation is considered carbon neutral
18 since crops absorb carbon during their growth
19 process. And, of course, when you utilize
20 those, they're -- that's emitted. But it's a
09:29:14 21 net -- results in net emissions of CO2 lower
09:29:16 22 than when co-firing. That's coming out of the
09:29:18 23 energy -- Department of Energy.

09:29:22 24 In our analysis we used the SERC region
09:29:28 25 as a study area and numerous models to do this,

09:29:34 1 one of which was a model that looks at
09:29:36 2 competition between fuels and power plants given
09:29:40 3 their current sulfur structure and things like
09:29:44 4 that. What we found was co-firing appears
09:29:48 5 economically competitive under the current
09:29:50 6 market conditions in some locations. Very small
09:29:56 7 amounts of residue and waste are feasible in the
09:30:00 8 base case that we ran. However, when we apply
09:30:02 9 the carbon tax of \$70 per ton, that changed. We
09:30:08 10 ran into two scenarios, a 2 percent co-fire and
09:30:16 11 15 percent co-fire scenario and both came in
09:30:18 12 rather demonstratively.

09:30:24 13 If you -- under the \$70 carbon tax, a
09:30:28 14 15 percent co-fire solution, we had a dedicated
09:30:32 15 energy crop of 1.6 million tons come into the
09:30:38 16 solution. That's the equivalent of
09:30:42 17 270,000 acres of cropland being converted to a
09:30:44 18 dedicated energy crop within the Valley. In
09:30:48 19 addition, we used some urban waste, forest
09:30:52 20 residue and mill waste and very little
09:30:52 21 agricultural residue because we need those for
09:30:58 22 soil -- soil con -- for soil conservation in
09:30:58 23 most cases within the region.

09:31:02 24 We looked -- as I say, we looked at
09:31:04 25 emissions from switch grass at the Gadsden Power

09:31:08 1 Plant. We harvested before frost and after
09:31:12 2 frost. And the reason that's important is with
09:31:16 3 switch grass it's synthesis which means
09:31:18 4 nutrients go down to the ground after -- after a
09:31:20 5 frost and that should mean less nitrogen in the
09:31:26 6 part of the crop that you're burning, the
09:31:28 7 nitrogen would be -- and we found that to be the
09:31:30 8 case. Using alternate proximate analysis, we
09:31:34 9 found that nitrogen was less in the crop if it
09:31:38 10 was harvested after November 1st.

09:31:46 11 We ran the analysis, and the carbon
09:31:48 12 emissions, as you might suspect, were lower when
09:31:54 13 we used switchgrass as a co-fire. CO2 emissions
09:32:00 14 declined when we used switchgrass as a co-fire.
09:32:06 15 Examples of switchgrass harvested after frost
09:32:10 16 had lower nitrogen content than before frost
09:32:12 17 samples. Grass nitrogen content did not appear
09:32:12 18 to affect overall nitrous oxide emissions during
09:32:18 19 these co-firing tests and, in fact, they might
09:32:20 20 have been slightly higher than with coal alone.
09:32:24 21 And the best guess, for that reason, even though
09:32:28 22 less nitrogen was going in, is the burner
09:32:28 23 configuration probably had something to do with
09:32:30 24 that and more analysis needs to be done there.
09:32:36 25 No difference was noted for NOx emissions,

09:32:44 1 co-firing before or after frost. For the same
09:32:46 2 grass, moisture content did not appear to affect
09:32:52 3 NOx emissions and CO emissions co-firing before
09:32:56 4 and after frost grasses were about the same, so.

09:33:02 5 We looked at the potential renewable
09:33:04 6 energy resources within the Valley in a study
09:33:12 7 with Jack Barkenbus who was contracted by TVA to
09:33:16 8 do the study. Animal waste from poultry litter
09:33:22 9 was used for a new power plant -- several new
09:33:24 10 power plants that we put in the model. Soybeans
09:33:28 11 were used to provide feedstock for new biodiesel
09:33:32 12 facilities. Biomass feedstocks to be co-fired
09:33:36 13 with coal, incremental hydro, methane generation
09:33:40 14 from new landfills, solar energy from
09:33:40 15 residential photovoltaic systems, wind turbines
09:33:44 16 for new power plants and methane generation were
09:33:48 17 also considered.

09:33:50 18 Using these renewable resources, Jack
09:33:52 19 Barkenbus estimated that there would be -- about
09:33:54 20 15 million megawatt hours might come from these
09:33:58 21 sources resulting in about 15,000 jobs directly
09:34:06 22 with another set of jobs that would occur in the
09:34:10 23 manufacturing of the renewable industry.

09:34:16 24 Finally, I would like to talk about the
09:34:20 25 farmers and consumers. We found that the

09:34:26 1 farmers are willing the grow switchgrass if
09:34:28 2 there's a profit. About 25 percent of the
09:34:34 3 farmers said they would not grow switchgrass
09:34:38 4 under any circumstance because they would pro --
09:34:40 5 they don't have the equipment to do it in the
09:34:42 6 state of Tennessee. They felt -- they felt
09:34:46 7 positive about it.

09:34:48 8 And, finally -- time is running short
09:34:52 9 here -- the consumers when we did the green
09:34:58 10 power study felt that their preference was a
09:35:02 11 little bit lower for forest waste and biomass
09:35:08 12 than solar and wind. They'd be willing to pay a
09:35:10 13 little bit less for that to be a renewable thing
09:35:14 14 compared to wind and solar. In other words,
09:35:16 15 they don't value that as much as a renewable
09:35:20 16 resource as wind and solar, but it is a
09:35:24 17 renewable resource according to them, if you
09:35:26 18 understand. They think there's more
09:35:28 19 environmental issues with that than with wind
09:35:30 20 and solar.

09:35:34 21 MR. FRANCIS: Thank you, Dr. English.
09:35:36 22 Mr. Holt.

09:35:36 23 MR. HOLT: Thank you. I'd like to
09:35:38 24 begin, as the others have done, by thanking the
09:35:40 25 Board for inviting me here. My remarks are

09:35:44 1 going to be a little less analytical and perhaps
09:35:46 2 more on -- more heavy on perspective. I want to
09:35:50 3 cover a little bit about why renewable energy is
09:35:52 4 important, talk about the process of setting
09:35:56 5 goals here in an uncertain environment, a bit
09:35:58 6 about utility scale renewables before I turn my
09:36:02 7 attention to distributor generation -- thank you
09:36:06 8 -- and then talk a little bit about the
09:36:10 9 voluntary consumer markets.

09:36:12 10 So I want to start a little bit with a
09:36:14 11 big picture perspective before talking about TVA
09:36:18 12 specifics and the big picture is climate change.
09:36:20 13 I'm not a climate scientist. I'm a renewable
09:36:22 14 energy consultant. But for the past decade, you
09:36:26 15 know, I've pretty much accepted what the
09:36:28 16 consensus opinion is and has been telling us
09:36:30 17 about climate change. But when I actually take
09:36:34 18 the time to read one of these reports that comes
09:36:36 19 out that talks about what the analysis and
09:36:40 20 modeling results are, it's really kind of scary,
09:36:42 21 a little overwhelming, and I wonder how really
09:36:46 22 we're going to beat this thing when we seem to
09:36:48 23 be talking about it, but we haven't really taken
09:36:52 24 a whole lot of action yet.

09:36:54 25 You know, I live in Maine and if I

09:36:54 1 could live to the end of this century, I might
09:36:58 2 be living in Tennessee without leaving my home
09:37:02 3 state. That's what the climate models are
09:37:06 4 showing Maine's climate to be, really
09:37:10 5 Washington, D.C.-like, at the end of this
6 century.

09:37:12 7 Now, I took a look to see what the
09:37:14 8 climate models are saying for Tennessee. They
09:37:18 9 say -- they tell us, according to studies from
09:37:22 10 2003, that average temperatures would rise a
09:37:26 11 little bit more than 4 degrees Fahrenheit by the
09:37:30 12 end of the century. This would provide a boost
09:37:32 13 in agriculture and hardwood forestry. That's
09:37:34 14 the good news.

09:37:34 15 The bad news is that the summer heat
09:37:38 16 index would rise by as much as 15 degrees
09:37:42 17 Fahrenheit. That would be pretty uncomfortable,
09:37:44 18 I think. The higher water temperatures would
09:37:48 19 lower oxygen levels, concentrate pollutants,
09:37:52 20 degrade water quality. You'd have higher
09:37:56 21 rainfalls which would be good for the hydro
09:37:58 22 system, but the warmer and wetter climate would
09:38:00 23 expand insect-borne disease such as malaria,
09:38:06 24 Lyme disease and Dengue fever, diseases that I
09:38:06 25 typically with a third world country rather than

09:38:10 1 the United States. So there's a serious problem
09:38:12 2 that needs to be addressed.

09:38:14 3 One of the questions that I know is
09:38:16 4 before the Board is, well, how do we plan when
09:38:20 5 we really don't know what the Federal government
09:38:22 6 wants us to do? What's the direction that
09:38:26 7 Congress is going to go in? Is Congress going
09:38:28 8 to pass an RPS with doffed carbon cap and trade?
09:38:30 9 First, I'd say they're not mutually exclusive
09:38:34 10 because RPS -- even if the Congress were to
09:38:40 11 adopt carbon cap and trade, there are other
09:38:40 12 reasons other than climate change for pursuing
09:38:44 13 renewable energy, including energy security, for
09:38:50 14 example, managing price risk of input fuels,
09:38:54 15 cleaner air, just managing your resources
09:38:56 16 through increased diversity.

09:38:58 17 So I think that probably TVA's least or
09:39:04 18 net strategy would be to set your own goals and
09:39:06 19 act on them. Even if TVA is exempted from
09:39:08 20 mandates, as it has been in some of the RPS
09:39:10 21 legislation, for example, I think the political
09:39:14 22 pressure will still be enormous and your
09:39:16 23 credibility and reputation as a steward of
09:39:20 24 natural resources might be called into question
09:39:22 25 if you don't, at least, meet those mandates that

09:39:26 1 are placed on others. I think the expectation
09:39:28 2 will be very similar for yourself.

09:39:30 3 So what's in your strategy? I would
09:39:32 4 look to see perhaps establishing a goal of
09:39:36 5 reducing greenhouse gas emissions by some
09:39:40 6 percentage. I'm not going to give you a
09:39:40 7 specific amount, but you could look to the
09:39:42 8 legislation to see, oh, what's being talked
09:39:44 9 about, what's likely to happen.

09:39:48 10 Assess what your potential is for
09:39:52 11 renewable resources. I don't have any
09:39:52 12 particular numbers here, but I believe the next
09:39:54 13 speaker is going to talk some about that more
09:39:56 14 explicitly. But you could set some explicit
09:40:02 15 renewable targets. They're easily trapped.
09:40:04 16 Again, look to what the legislation is most
09:40:06 17 recently, 15 percent by 2020. You know, it's
09:40:10 18 called a renewable portfolio standard and I'd
09:40:12 19 emphasize the "portfolio." You'd want to look
09:40:16 20 at a variety of resources and not just one or
09:40:18 21 two.

09:40:20 22 Building new capacity in a carbon
09:40:22 23 constrained world is challenging because there
09:40:24 24 are no easy answers even among renewables.
09:40:28 25 Wind, for example. You know, you have some

09:40:30 1 wind. You could build on what you've already
09:40:32 2 done. The Southeast is not the Saudi Arabia of
09:40:38 3 wind, but that doesn't mean you don't have any
09:40:40 4 suitable windy sites at all that could be
09:40:40 5 developed. To put it another way, just because
09:40:42 6 you don't have the musical talent to make it big
09:40:46 7 in Nashville doesn't mean you can't sing in the
09:40:48 8 choir. So you can, you know, use the talents or
09:40:52 9 the resources that you have and develop them.

09:40:54 10 Solar, yes, it's extensive, but so was
09:40:56 11 wind 20 years ago. And as the solar systems,
09:41:02 12 particularly photovoltaics get larger, the
09:41:04 13 economies of scale do kick in and make it --
09:41:06 14 begin to make it relatively more competitive.

09:41:08 15 Biomass, we've just heard a great
09:41:12 16 presentation about that. There's plenty
09:41:14 17 resource here in the Southeast, probably the
09:41:18 18 largest resource here, but every silver lining
09:41:20 19 has its cloud and there's competition for that
09:41:22 20 resource. There's competition from traditional
09:41:26 21 industry such as pulp and paper and building
09:41:28 22 supplies and then from transportation fuels.
09:41:30 23 Nevertheless, it's the most plentiful in the
09:41:34 24 Southeast and certainly you could do things like
09:41:38 25 more co-firing or encourage stand-alone biomass

09:41:42 1 gasification plants.

09:41:42 2 Then finally, hydro. You know, TVA has
09:41:46 3 built on that historic resource and you have
09:41:48 4 your hydro modernization program to squeeze a
09:41:54 5 few extra megawatts out of -- out of the systems
09:41:56 6 that you have in place. Incremental hydro, I
09:42:00 7 would note, is a real resource that's eligible
09:42:02 8 under the Federal RPS bills that have been put
09:42:04 9 forward. So how about looking at some new
09:42:08 10 technologies and applications such as in-stream
09:42:12 11 turbines or without impounding water.

09:42:14 12 Now, let me turn to distributor
09:42:16 13 generation. Distributor generation, there are
09:42:20 14 different definitions out there. Mine simply is
09:42:22 15 that in which generation is interconnected at
09:42:26 16 the distribution level rather than at the
09:42:28 17 transmission level. That does provide a measure
09:42:30 18 of energy security. But a lot of utilities in
09:42:34 19 the past, at least, historically have been luke
09:42:38 20 warm, if not hostile, to distributor generation
09:42:42 21 because it does take away from sales from the
09:42:46 22 utility power plants. It may be more difficult
09:42:48 23 -- if there were a lot of these things out
09:42:50 24 there, it may be more difficult to manage and
09:42:52 25 control a system.

09:42:54 1 Utilities have put barriers in place
09:42:56 2 for -- or against distributor generation. But I
09:43:00 3 think it's certainly worth a very hard and
09:43:04 4 concerted look. For example, you could do some
09:43:06 5 technical analysis about what's the effect of
09:43:08 6 having some hypothetical quantities, megawatts
09:43:14 7 of distributor generation different places.
09:43:16 8 Work with your distributors to do that analysis
09:43:18 9 before you embark on anything too significant.

09:43:24 10 Also, investors need security. If you
09:43:26 11 want the private sector to invest in these kinds
09:43:28 12 of systems, they need to know what the situation
09:43:30 13 is, not only in terms of interconnection
09:43:34 14 standards, but also with whether or not there's
09:43:36 15 going to be some form of payment, what they'll
09:43:38 16 get for the energy or for the renewable energy
09:43:42 17 credits. So you might encourage a standard
09:43:44 18 offer which would be specific to different
09:43:46 19 technologies. This has been a policy that's
09:43:50 20 been extremely successful in Europe in
09:43:54 21 developing renewable resources there.

09:43:56 22 If pursued, to a large extent
09:44:00 23 distributor generation really could become an
09:44:00 24 economic development strategy, but that would
09:44:02 25 require a multiple range of activities to

09:44:06 1 support it because you'd need critical mass of
09:44:08 2 infrastructure in services, you'd need training,
09:44:10 3 education, you'd need to create or be able to
09:44:14 4 support and design and service installation
09:44:16 5 services and this needs to be targeted to
09:44:20 6 different technologies, as well.

09:44:22 7 Now, I'd like to turn to voluntary
09:44:26 8 green power briefly. Customers like choices and
09:44:30 9 some customers will want to go beyond TVA plans.
09:44:32 10 I think the critical or the key point here is
09:44:36 11 that voluntary customer actions and TVA actions
09:44:38 12 are compatible, but the key thing is that
09:44:42 13 customer options must be incremental or in
09:44:44 14 addition to whatever TVA is planning to do.

09:44:46 15 It doesn't really matter whether TVA
09:44:48 16 adopts its own goal or is mandated by Congress
09:44:52 17 to do a certain amount of renewables, but
09:44:54 18 whatever that is, it becomes the baseline,
09:44:56 19 business as usual, and customers want to make a
09:45:00 20 difference beyond that. If they're going to be
09:45:02 21 asked to pay extra money, they want that to be
09:45:06 22 truly incremental.

09:45:06 23 And I would point out that one way to
09:45:08 24 track that is through these renewable energy
09:45:12 25 certificate tracking systems, which most regions

09:45:14 1 of the country now have in place. There is a
09:45:16 2 private system that's being developed by the
09:45:18 3 same entity that has developed most of the other
09:45:20 4 systems that will have this in place within this
09:45:24 5 year for the Southeast. So you may see that
09:45:28 6 available to you.

09:45:32 7 Your Green Power Switch Program has
09:45:34 8 been doing well, it's been increasing steadily,
09:45:38 9 but it's not yet at the level of the median for
09:45:44 10 the U.S. The U.S. is now about 1 percent in
09:45:46 11 terms of customer participation and so I think
09:45:48 12 you could do better. Certainly if given the
09:45:50 13 resources, you will be able to do that. The
09:45:52 14 advertising has been shown from your own work to
09:45:54 15 be quite effective.

09:45:56 16 So in conclusion, I would just say you
09:45:58 17 need to set a bold and clear course with
09:46:02 18 quantified targets, continue to provide your
09:46:04 19 oversight in management interest so it stays a
09:46:06 20 priority, support your programs and staff to do
09:46:10 21 the hard work of implementing it, and be
09:46:12 22 publicly accountable by involving your
09:46:14 23 distributors and stakeholders in monitoring your
09:46:16 24 progress. Thank you very much.

09:46:18 25 MR. FRANCIS: Thank you, Mr. Holt. Our

09:46:20 1 next speaker will be Mr. Wilson.

09:46:24 2 MR. WILSON: Thank you very much,
09:46:26 3 Mr. Chairman, members of the Board, Mr. Kilgore.
09:46:28 4 And I'd also like to thank the staff and the
09:46:30 5 translators here working very hard. I think
09:46:34 6 it's important that we have clear communication
09:46:36 7 and they've done a very good job of organizing
09:46:40 8 this event around that.

09:46:40 9 Steve Smith, our executive director,
09:46:44 10 yesterday introduced the Southern Alliance for
09:46:44 11 Clean Energy. I would just like to mention that
09:46:46 12 I personally have not got as long a history in
09:46:50 13 working with the Tennessee Valley Authority as
09:46:52 14 Steve does. I've been working primarily in the
09:46:56 15 Carolinas and Florida for our organization
09:46:58 16 recently. But I do have a personal history with
09:47:00 17 the Tennessee Valley Authority. My great
09:47:04 18 grandfather's farm is at the bottom of
09:47:06 19 Gunter'sville Lake. There are some members of my
09:47:10 20 family -- most of them have passed, the ones
09:47:12 21 who were -- maybe have a little grudge about
09:47:14 22 that. But at least it was at the bottom of the
09:47:18 23 lake until recently, maybe. At any rate. And
09:47:22 24 I'd like to thank Mr. Holt for really framing up
09:47:26 25 the issue very well.

09:47:28 1 I'd like to focus most of my remarks on
09:47:30 2 what the potential is for the Tennessee Valley
09:47:34 3 Authority to implement specific renewable energy
09:47:38 4 generation strategies. I also -- I would agree
09:47:40 5 generally with the remarks earlier of Mr. Bull
09:47:44 6 from NREL, although I think I would see the
09:47:48 7 glass as maybe a little bit more half full than
09:47:52 8 half empty in some of that and I'll go through
9 some of the areas where I think we can really
09:47:54 10 move forward quickly.

09:47:54 11 I'd also like to talk a little bit
09:47:56 12 about the advantages and challenges of
09:47:58 13 renewables. The earlier remarks about
09:48:02 14 transmission and those kind of issues are very
09:48:04 15 much on point. This is not just about finding
09:48:08 16 the resource. It's about delivering it, as
09:48:10 17 well. And, finally, I'd like to talk a little
09:48:12 18 bit about how we can make sure that the TVA is
09:48:14 19 accountable for its results.

09:48:20 20 I believe based on analysis of other
09:48:22 21 data, not anything particularly original to our
09:48:24 22 organization, that the TVA has the potential to
09:48:28 23 meet 20 percent of its current sales with
09:48:30 24 existing technology and in renewable energy that
09:48:34 25 is within the TVA service area. There's

09:48:38 1 basically four major resource categories that I
09:48:40 2 think would need to be assembled in a portfolio
09:48:42 3 to meet that.

09:48:44 4 The first is ridge line wind in the
09:48:46 5 Appalachians, biomass in Tennessee, biomass in
09:48:50 6 Mississippi, and low head hydro, basically small
09:48:54 7 upgrades to the hydro system. So you might even
09:48:56 8 think of this as a way -- sort of the start of
09:49:00 9 an organizational chart with maybe four senior
09:49:02 10 executives assigned to work in each of these
09:49:06 11 areas.

09:49:06 12 With respect to the wind, most of our
09:49:08 13 data is actually based on a TVA Appalachian
09:49:14 14 State University study that was completed in
09:49:16 15 2005 and you all identified 345 miles of ridge
09:49:20 16 line with wind potential. Of those we sort of
09:49:24 17 read between the lines in your report and
09:49:28 18 identified five regions out of that that we felt
09:49:30 19 were the most suitable, that they were not on
09:49:32 20 sensitive lands such as national parks, that
09:49:36 21 sort of thing. And out of that, we think
09:49:38 22 there's a potential generation capacity of about
09:49:42 23 5800 gigawatt hours. This would be about a
09:49:46 24 quarter of the 20 percent goal.

09:49:48 25 One of the things I've mentioned is

09:49:50 1 that is based on some methods developed at
09:49:52 2 Appalachian State to analyze that and the --
09:49:56 3 while I think it's very exciting to hear about
09:49:58 4 the new larger turbines, one of the things they
09:50:00 5 mentioned is that the -- it's unlikely that you
09:50:02 6 would build even the current largest turbines on
09:50:06 7 those sites because it's very difficult to move
09:50:10 8 that equipment up to the top of the ridge lines
09:50:12 9 in a construction process. So we've based this
09:50:14 10 assessment on what they told us was basically
09:50:16 11 the largest and most feasible turbine
09:50:20 12 installation that could be put in those areas.

09:50:22 13 There is one additional region in our
09:50:24 14 assessment that we added to yours which comes
09:50:26 15 from an AWS Truewind study that identified a
09:50:30 16 large ridge line in Northern Georgia that I
09:50:34 17 believe is either in or contiguous to the TVA
09:50:36 18 service area there and that would add another
09:50:38 19 big chunk of wind. So you've got basically six
09:50:42 20 areas that you could be developing the wind on.

09:50:46 21 Another kind of interesting thing from
09:50:46 22 the ASU analysis in North Carolina is that
09:50:50 23 they've typically excluded from their analysis a
09:50:54 24 few sites in the Appalachians where the wind is
09:50:58 25 too strong. They say basically the maintenance

09:51:00 1 requirements for the turbines given the location
09:51:02 2 up on the top of the ridge lines would exceed
09:51:06 3 the practicality of those sites. So I think
09:51:08 4 there's a widespread perception in the Southeast
09:51:12 5 that we don't have enough wind, but it is worth
09:51:14 6 noting that there's a few very small areas where
09:51:18 7 we can't even -- where there's too much.

09:51:20 8 Turning to biomass briefly, we've
09:51:22 9 identified the potential based on a variety of
09:51:26 10 studies that we've integrated and I've listed
09:51:30 11 some of them in my written remarks. The major
09:51:30 12 concentration in the TVA service area is
09:51:32 13 probably in Tennessee and Mississippi, but other
09:51:36 14 TVA areas also have a lot of available resource.
09:51:42 15 And this is based on assessments of existing
09:51:44 16 production. These are basically waste materials
09:51:46 17 or other materials that are out there. This is
09:51:50 18 not talking about ramping up, harvesting of
09:51:56 19 forest land.

09:51:56 20 Turning to hydroelectric, Idaho
21 National Laboratory has done some studies on
22 this area and we've just simply assembled their
09:52:04 23 data and applied it to the TVA service area and
09:52:04 24 that, I think, is another big area. These are
09:52:06 25 going to be typically small distributed

09:52:10 1 generation class facilities and I think that it
09:52:12 2 might be done more in an RFP type of power
09:52:16 3 acquisition strategy as opposed to a direct
09:52:20 4 capital investment by TVA. So there's a lot of
09:52:24 5 sites that could be assembled into a utility
09:52:28 6 scaled project.

09:52:32 7 In addition, there's been some
09:52:34 8 discussion of solar and geothermal. We'd like
09:52:36 9 to see solar focussed on managing the summer
09:52:40 10 peak loads and solar hot water is already a cost
09:52:44 11 effective technology. Sometimes it's classified
09:52:44 12 as energy efficiency, sometimes as a renewable.
09:52:48 13 I could really care less where it's classified.
09:52:48 14 Let's just get it done.

09:52:50 15 And then one thing I'd like to add for
09:52:52 16 sort of perspective is in terms of photovoltaics
09:52:56 17 when utility scale generation becomes feasible.
09:53:02 18 If you just wanted to get 10 percent of
09:53:04 19 Tennessee's electricity from photovoltaics, it
09:53:06 20 would require land area that is significantly
09:53:08 21 less than is currently used by golf courses in
09:53:12 22 the state.

09:53:14 23 And then another thing that's sort of
09:53:18 24 common perception is that the sun doesn't shine
09:53:20 25 as much here as it does in some other areas.

09:53:22 1 When you look at Florida, the estimate is is
09:53:26 2 that it takes about -- photovoltaics over 1
09:53:30 3 meter, you get about 90 kilowatt hours in a
09:53:34 4 year. That's the same area in Tennessee would
09:53:36 5 give you 80. So it's only about a 10 or
09:53:42 6 11 percent difference between the two states in
7 terms of the productivity of photovoltaic
8 panels.

09:53:46 9 Finally, obviously, there's some really
09:53:48 10 significant advantages to renewables in terms of
09:53:52 11 energy security and little or no fuel cost for
09:53:54 12 wind and also for solar. Once you assemble
09:54:00 13 enough different sites in your portfolio with
09:54:02 14 wind in particular, the idea of intermittency, I
09:54:06 15 mean, there's no way the wind is going to stop
09:54:08 16 blowing from Virginia to Georgia all at once.
09:54:12 17 There's always going to be a significant supply
09:54:12 18 of electricity, even on the calmest periods of
09:54:16 19 the year.

09:54:20 20 With biomass it is a very reliable and
09:54:24 21 firm dispatch resource that has very different
09:54:24 22 characteristics than wind. There's a lot of
09:54:26 23 combined heat and power opportunities with
09:54:28 24 biomass and it is a very low pollution
09:54:30 25 technology, especially if you -- once you move

09:54:34 1 from co-firing to gasification. But I would
09:54:36 2 think that the co-firing would be the logical
09:54:38 3 first step and I think Dr. English talked a lot
09:54:42 4 about its performance statistics.

09:54:44 5 One thing we really need to focus on
09:54:48 6 with biomass is understanding the sustainability
09:54:50 7 issues associated with the resource. We've had
09:54:52 8 some major, what I would consider, debacles in
09:54:56 9 that area with the ethenol policy in the U.S.
09:54:58 10 and the biodiesel policy in Europe. In both
09:55:02 11 cases, people did not really think through the
09:55:04 12 sustainability issues going into those policies
09:55:08 13 and so it's not as if we tried and failed. We
09:55:10 14 simply have not tried to do it right yet
09:55:14 15 anywhere that I'm aware of at a large scale and
09:55:18 16 maybe the TVA can be a leader in thinking
09:55:20 17 through this correctly.

09:55:22 18 With hydroelectric, you all know very
09:55:24 19 well how to operate a hydroelectric system. I
09:55:28 20 think the smaller scale facilities that I'm
09:55:30 21 suggesting you take a look at would require a
09:55:34 22 little bit of a different thinking about
09:55:34 23 dispatch and system integration, but these are
09:55:38 24 not going to be complicated for the skill level
09:55:42 25 of your engineering staff, I'm sure. And by the

09:55:46 1 way, I would mention that the data that I sorted
09:55:48 2 are already sort of prescreened at a national
09:55:52 3 level. It's a fairly crude approach, but
09:55:54 4 they're prescreened for environmental and
09:55:56 5 economic feasibility.

09:56:00 6 Finally, putting this in perspective in
7 terms of accountability, we do think that the
09:56:02 8 TVA can meet a national RPS standard and we
09:56:06 9 would urge your support for including the TVA in
09:56:08 10 that framework so that its customers are on the
09:56:10 11 same basic level playing field with the rest of
09:56:14 12 the customers in the country. 20 percent
09:56:16 13 renewable potential is ambitious, but it's
09:56:20 14 doable. Certainly a 15 percent is very doable.
09:56:24 15 And we think that this meets -- in combination
09:56:28 16 with the energy efficiency measures that we
09:56:30 17 talked about yesterday, it would be very
09:56:32 18 possible to reduce or eliminate growth in fossil
09:56:36 19 fuel and nuclear production using these
09:56:38 20 strategies in combination.

09:56:40 21 Finally, I'll just wrap up by
09:56:42 22 mentioning that the -- in addition to the
09:56:46 23 utility scale generation, you continue support
09:56:50 24 for customer scale generation, energy recycling
09:56:54 25 programs, the TVA generation partners, those

09:56:56 1 sorts of programs. Those are essential to
09:56:58 2 developing the expertise and understanding of
09:57:00 3 these resources in the region. Thank you very
09:57:02 4 much.

09:57:04 5 MR. FRANCIS: Thank you, Mr. Wilson.
09:57:04 6 Ms. Wingate will be the final speaker on the
09:57:08 7 environmental panel.

09:57:10 8 MS. WINGATE: Hi. Good morning. I
09:57:10 9 apologize because I've got -- picked up a bit of
09:57:12 10 a cold. I want to thank the TVA for inviting me
09:57:18 11 to speak today. I come from the Center for
09:57:20 12 Resource Solutions. We are a nonprofit
09:57:22 13 organization located in San Francisco. We
09:57:26 14 promote renewable energy and energy efficiency
09:57:30 15 through policy assistance and through our
09:57:32 16 certification programs and we run the nation's
09:57:34 17 leading certification program, the Green-e
09:57:38 18 Program of which TVA has been a participant for
09:57:40 19 over eight years. Over 150 of TVA's
09:57:46 20 distributors are currently offering Green-e
09:57:50 21 certified products and I want to thank the TVA
09:57:52 22 directors for your participation in the program
09:57:54 23 over the years.

09:57:56 24 There is an urgency today like never
09:58:00 25 before to address the problems of climate change

09:58:04 1 and of the local regional air pollution. Simply
09:58:06 2 put, more needs to be done to lessen our
09:58:10 3 country's dependence on coal power.

09:58:12 4 I want to applaud the TVA directors for
09:58:12 5 taking leadership in this role and for hosting
09:58:18 6 this workshop and developing a strategic plan
09:58:22 7 for renewables. You're not alone. Every
09:58:24 8 utility in the country needs to be thinking
09:58:28 9 about and planning for a transition to a cleaner
09:58:28 10 energy generation future. There is a very good
09:58:32 11 chance that some Federal legislation will be
09:58:34 12 passed on either climate change or some sort of
09:58:38 13 renewable portfolio standard in the next few
09:58:40 14 years and companies need to be proactive on
09:58:44 15 this.

09:58:44 16 There is a good likelihood that if such
09:58:46 17 legislation were passed that there would be some
09:58:50 18 tradable credit mechanism that would essentially
09:58:54 19 allow parties to essentially buy their way out
09:58:58 20 of their obligation perhaps with North Dakota
09:59:02 21 wind RECs, but I want to caution you against
09:59:04 22 that approach because then you will miss out on
09:59:06 23 the very real economic and environmental
09:59:08 24 benefits from establishing a local renewable
09:59:12 25 energy industry here in the region.

09:59:18 1 Now, you can't build a local renewable
09:59:20 2 capacity in a day or a year or even five years.
09:59:22 3 It takes time and it takes planning and good
09:59:26 4 policies. Voluntary markets can only get you so
09:59:30 5 far, but you need clear goals that will help
09:59:34 6 internally guide and prioritize where to invest
09:59:36 7 resources. So I would like to introduce a few
09:59:40 8 ideas that I hope you will consider to encourage
09:59:42 9 new renewable development in the region.

09:59:46 10 The first is a directive that we've
09:59:48 11 used in California that has been successful and
09:59:52 12 it's the establishment of a loading order.
09:59:54 13 Renewable and energy efficiency really need to
09:59:56 14 be integrated into TVA's resource planning and
10:00:00 15 this may require a shift in thinking from these
10:00:02 16 as consumer programs to really integrated into
10:00:08 17 internal procurement decisions.

10:00:10 18 As I mentioned, in California we have
10:00:14 19 adopted a loading order which essentially
10:00:16 20 directs the utilities to meet all new demand,
10:00:20 21 first with energy efficiency, next with demand
10:00:22 22 response, third with renewables, and fourth with
10:00:24 23 clean fossil generation. And I would encourage
10:00:28 24 TVA to adopt a similar type of loading order in
10:00:32 25 their resource planning process.

10:00:34 1 Now, yesterday you spent the day
10:00:36 2 talking about efficiency, so I'm not going to
10:00:38 3 talk about that, but I want to focus my remarks
10:00:42 4 on how to encourage local renewable development.
10:00:48 5 You've heard a bit about voluntary markets from
10:00:50 6 Ed Holt. Clearly there is growing demand out
10:00:52 7 there for -- on a voluntary basis by companies
10:00:58 8 and individuals who want to make meaningful
10:01:02 9 choices -- to want to have meaningful choices
10:01:04 10 about their electricity supply and want to do
10:01:06 11 something themselves to help address climate
10:01:08 12 change and air pollution and support a cleaner
10:01:12 13 transition, transition to a cleaner energy
10:01:16 14 future.

10:01:16 15 Nationally renewable energy voluntary
10:01:20 16 markets are supporting about 3500 megawatts of
10:01:24 17 primarily new renewable generation. In 2006
10:01:28 18 the purchases were estimated to total about
10:01:30 19 12 million megawatts hours and the voluntary
10:01:34 20 market is continuing to grow. If it grows in
10:01:36 21 the way it has, it's expected to reach about
10:01:38 22 one-quarter of the total demand from all
10:01:42 23 voluntary and compliance markets combined.

10:01:44 24 I hope that TVA will continue to
10:01:46 25 support its green pricing programs, but I want

10:01:52 1 to also caution, as other speakers have noted,
10:01:54 2 that the voluntary programs should be in
10:01:58 3 addition to other policy or other mandates that
10:02:00 4 TVA may develop. Now, the voluntary market can
10:02:04 5 play a role in helping to encourage renewable
10:02:08 6 development in the region, but it's not going to
10:02:12 7 -- it cannot alone be a significant driver for
10:02:16 8 large scale renewable development.

10:02:18 9 In addition to voluntary programs, what
10:02:22 10 are needed are good policies that help
10:02:24 11 renewables overcome market barriers, that help
10:02:28 12 spur investment and facilitate financing for
10:02:30 13 renewable projects and that help achieve economy
10:02:34 14 as a scale and I think that's really what you
10:02:36 15 need here.

10:02:36 16 We've heard a bit about tax credits and
10:02:40 17 funds and renewable portfolio standards. I want
10:02:44 18 to talk a little bit about the renewable
10:02:46 19 portfolio standard and also about a feed-in
10:02:48 20 tariff. Now, I know that TVA is interested in
10:02:50 21 developing its own resources, but I would have
10:02:56 22 you consider that there are parties out there,
10:02:58 23 third parties that you may want to call upon to
10:03:02 24 help develop resources. And if you do this, a
10:03:04 25 feed-in tariff can be a very useful policy.

10:03:08 1 Essentially what a feed-in tariff is is
10:03:10 2 when it's a price paid that the utility will
10:03:12 3 agree to pay for all renewable projects that
10:03:16 4 meet certain specifications. If it's designed
10:03:18 5 well and priced appropriately, a feed-in tariff
10:03:22 6 can be one of the most effective ways to get
10:03:24 7 renewable resources installed in the ground
10:03:26 8 quickly. It's been hugely successful in
10:03:28 9 California and in Europe and it's one of the
10:03:32 10 most tried and true policies for help building
10:03:36 11 up renewable supply.

10:03:40 12 The other great thing about a feed-in
10:03:44 13 tariff is that it can be structured to encourage
10:03:44 14 certain technologies and it can be structured to
10:03:46 15 encourage different size projects, everything
10:03:48 16 from utility scaled project to distributed
10:03:50 17 generation. It can be adjusted for resource
10:03:54 18 qualities and just about any other factor that
10:03:56 19 you can think of. So the idea here is that a
10:03:58 20 feed-in tariff can be used to really develop a
10:04:02 21 wide portfolio of renewable resources in the
10:04:04 22 region. It's a very flexible policy. It has a
10:04:08 23 low administrative overhead cost and, as I
10:04:12 24 mentioned, it's been hugely successful in other
10:04:14 25 regions.

10:04:16 1 The next policy I want to talk a little
10:04:18 2 bit about is the renewable portfolio standard.
10:04:22 3 The renewable portfolio standard has been good
10:04:24 4 in other states. It can be used to -- it's
10:04:26 5 really used to help create a demand for
10:04:30 6 renewable electricity. In other words, it
10:04:32 7 creates market pool. It is known to be a cost
10:04:36 8 effective way to drive new renewable
10:04:40 9 development, but I believe the RPS works best
10:04:42 10 when there is an existing pool of resources from
10:04:46 11 which parties can draw upon. And for this
10:04:48 12 reason, I would recommend it as a secondary
10:04:50 13 policy to something like a feed-in tariff.

10:04:56 14 The RPS is a little more complicated to
10:05:00 15 implement. It can have a higher administrative
10:05:02 16 overhead. It does not have -- it does not
10:05:06 17 provide the predictability and stability that
10:05:08 18 renewable developers need to finance new
10:05:10 19 renewable projects.

10:05:14 20 So I've got just a few minutes left.
10:05:16 21 I just want to summarize my main points. There
10:05:20 22 is some urgency here to be proactive in
23 anticipation of either Federal legislation on
10:05:28 24 carbon or renewables. If you wait out, you will
10:05:28 25 miss out on the very real economic and

10:05:30 1 environmental benefits that can result from
10:05:32 2 having local renewable development in your
10:05:36 3 region. Voluntary markets are good, they are
10:05:38 4 important. I encourage TVA to continue
10:05:42 5 supporting your green pricing customers, but
10:05:44 6 they can only get you so far in terms of
10:05:46 7 building up a renewable supply in the region.
10:05:48 8 What's needed are good policies that are going
10:05:52 9 to create a predictable and stable market that
10:05:56 10 project financiers require. Two policies that I
10:06:00 11 would recommend are the feed-in tariff and the
10:06:02 12 RPS.

10:06:04 13 Finally, to echo some of Ed Holt's
10:06:08 14 bigger picture thoughts, renewables and energy
10:06:12 15 efficiency really need to be integrated into the
10:06:14 16 planning process. The creation of the loading
10:06:16 17 order can be helpful to do this. It helps
10:06:20 18 articulate an organization's commitment to
10:06:20 19 renewables and energy efficiency and it helps
10:06:24 20 establish some goals that will help direct where
10:06:26 21 to put new investments in the organization.

10:06:30 22 I thank you very much for your time
10:06:32 23 today and look forward to working with you and
10:06:34 24 the other esteemed colleagues on the panel in
10:06:38 25 the future. Thank you.

10:06:38 1 MR. FRANCIS: Thank you, Ms. Wingate.

10:06:38 2 At this time the Board may have questions of the

10:06:40 3 panel.

10:06:46 4 MR. BOTTORFF: Ms. Wingate, I didn't

10:06:50 5 quite understand. Is it what in tariff that you

6 were saying? You said it about five --

7 MS. WINGATE: Feed-in. A feed-in

10:06:50 8 tariff.

9 MR. BOTTORFF: Feed-in. Is that San

10 Francisco, feeling?

11 MS. WINGATE: No. No.

12 MR. BOTTORFF: A feed-in. Can you --

10:07:04 13 MS. WINGATE: It's sort of more of an

10:07:04 14 international term.

10:07:06 15 MR. SANSOM: Can you give us examples

10:07:08 16 or an example of a feed-in, how it works?

10:07:08 17 MS. INGRATE: Yes. Well, essentially a

10:07:10 18 price is set. Usually it can -- the price can

10:07:12 19 be set in a variety of different ways. But

10:07:16 20 essentially, you know, it's -- you put a price

10:07:20 21 out there and you say, we will develop -- we

10:07:22 22 will take all power at this price, and you can

10:07:26 23 set certain criteria for the different types of

10:07:30 24 power, whether it's different resource class,

10:07:34 25 for example solar might be at a certain price,

10:07:38 1 wind may be a different price, biomass may be a
10:07:40 2 different price.

10:07:42 3 It's usually the wholesale cost plus a
10:07:44 4 reasonable rate of return. It could also be the
10:07:46 5 avoided cost. There are a number of different
10:07:48 6 ways that you can structure it. As I mentioned,
10:07:52 7 there's a huge amount of experience. Almost all
10:07:56 8 the European countries have used the feed-in
10:08:00 9 tariff as a way to really build up renewable
10:08:00 10 supply quickly. In California it was
10:08:04 11 implemented in the '80s and was responsible for
10:08:06 12 bringing 6,000 megawatts on line.

10:08:08 13 Now, of course, we have a different
10:08:10 14 resource regime here in the Southeast, but I
10:08:12 15 think you've heard from other panelists today
10:08:14 16 that there are resources in the region that can
10:08:18 17 be tapped into. It's just really a matter of
10:08:22 18 encouraging the development to come and setting
10:08:24 19 a price that allows a reasonable rate of return
10:08:28 20 as one very effective way to do it.

10:08:32 21 MR. BOTTORFF: So you publish that and
10:08:34 22 create demand --

23 MS. WINGATE: Yes.

10:08:34 24 MR. BOTTORFF: -- because people know
10:08:36 25 you'll take power at that price?

10:08:38 1 MS. WINGATE: That's right.

10:08:40 2 MR. BOTTORFF: And then that creates
10:08:42 3 people willing to produce or take generation
10:08:44 4 risks on the investment because they know if
10:08:44 5 they can make that happen, they can sell it. Is
6 that what it is?

7 MS. WINGATE: That's right.

8 MR. BOTTORFF: I got it.

10:08:48 9 MS. WINGATE: And because the price is
10:08:50 10 known in advance, it provides the predictability
10:08:54 11 and the stability that financiers and banks
10:08:58 12 require. The problem with the RPS is that you
10:09:00 13 know that there's demand out there, you don't
10:09:02 14 know -- as a developer, you don't know who else
10:09:06 15 is going to be meeting that demand, you don't
10:09:08 16 know what price you're going to get. And that
10:09:12 17 makes it, in terms of a policy to encourage
10:09:14 18 investment and development in the region, a
10:09:18 19 little bit less effective. It may be -- you may
10:09:20 20 get cheaper power that way, but not necessarily.

10:09:26 21 Another thing about the feed-in tariff
10:09:28 22 is that the price can be adjusted over time as
10:09:34 23 economies of scale are achieved. And if you
10:09:36 24 find that you're getting so many takers, you can
10:09:40 25 lower the price over time to accommodate that,

10:09:44 1 make adjustments.

10:09:46 2 MR. BOTTORFF: Could you give us some
10:09:46 3 ideas of what the prices -- California has
10:09:50 4 implemented this successfully; is that correct?

10:09:52 5 MS. INGRATE: Yeah. California
10:09:54 6 implemented it in the 1980s and it's -- there's
10:09:58 7 not so much of that happening right now. We
10:10:00 8 have an aggressive RPS and we have a good base
10:10:02 9 load and there's a lot of development in the
10:10:04 10 region, so there are not that many entities that
10:10:08 11 are using the feed-in tariff anymore.

10:10:14 12 But as far as an example of price -- I
10:10:18 13 don't know if perhaps -- I don't want to even
10:10:22 14 venture. Go ahead, Ed.

10:10:24 15 MR. HOLT: I can say that I don't know
10:10:24 16 what California was. In Europe it's been very
10:10:28 17 successful, but one reason they've been very
10:10:28 18 successful is because they have set quite high
10:10:32 19 rises for wind, for example. And I refer to the
10:10:36 20 standard offer. But the tariff price is -- has
10:10:38 21 been around 17 cents a kilowatt hour. So, you
10:10:44 22 know, it's high. That's why they've developed a
10:10:46 23 lot of wind.

10:10:50 24 MR. BOTTORFF: Yeah. If TVA sets that
10:10:50 25 price, I might try to get a --

10:10:54 1 MR. HOLT: Well, that's the point. If
10:10:56 2 you set a high enough price, you will motivate a
10:10:58 3 response.

10:11:00 4 MR. THRAILKILL: I have a question for
10:11:02 5 Dr. English. Most of the studies I've seen on
10:11:06 6 producing biofuels like switchgrass ignore two
10:11:10 7 factors that when I dug into it I found
10:11:12 8 significant. One is the use of water, which in
10:11:16 9 the case of corn-based ethenol production is
10:11:20 10 enormous, and I wanted to know what your studies
10:11:22 11 show as far as switchgrass is concerned. And,
10:11:26 12 secondly, there's a -- if you net out the
10:11:32 13 deforestation to create new cropland, you reduce
10:11:36 14 the environment's ability to absorb CO2. To
10:11:36 15 what extent have you looked into those two
10:11:42 16 factors?

10:11:42 17 DR. ENGLISH: Well, the second, I have
10:11:42 18 not looked at that aspect. I know of two papers
10:11:46 19 that have recently come out that basically claim
10:11:50 20 that the carbon is -- the payback for the carbon
10:11:56 21 lost in land conversion is significant. They're
10:12:00 22 taking it all the way back to the Amazon,
10:12:04 23 because if we take an acre of soybeans out of
10:12:08 24 production here, there's some acre of soybeans
10:12:14 25 in Brazil needs to be put into production and,

10:12:14 1 therefore, reduce the Amazon. That's a stretch,
10:12:18 2 but I think that's what they're assuming.

10:12:24 3 I believe that if we take out an acre
10:12:30 4 of soybeans in Tennessee and convert it to
10:12:32 5 switchgrass that we have enough latitude within
10:12:40 6 our other production acres to increase
10:12:42 7 production to attain the additional yield that
10:12:48 8 would be lost in that acre. We have enough
10:12:52 9 inefficiencies in our system still that we can
10:12:54 10 forego that for a while.

10:12:58 11 As far as water is concerned, I did an
10:13:02 12 analysis. If we use corn ethenol to meet the 18
10:13:06 13 million -- 15 million gal -- 16 million gallons
10:13:10 14 is what I used -- 16 million gallon mandate in
10:13:16 15 2016, the environmental impacts would be
10:13:18 16 significant in this country, you know,
10:13:22 17 additional herbicides, additional soil erosion
10:13:28 18 and sediment delivery, carbon emissions would
10:13:32 19 increase and carbon sequestration decline
10:13:36 20 because of that.

10:13:38 21 With switchgrass, that's not the case,
10:13:42 22 or a perennial energy crop, be it POPLAR tree
10:13:48 23 crop or whatever, because you're not planting
10:13:50 24 every year. You don't have the input use. Corn
10:13:54 25 at the yields that they're getting will probably

10:13:56 1 put you at 180 to 210 pounds of xenon. We're
10:14:02 2 suggesting 60 pounds of xenon of switchgrass
10:14:06 3 every year. We're not putting herbicides or
10:14:10 4 insecticides at this point. We see no problem
10:14:12 5 with insects yet on switchgrass. We haven't
10:14:18 6 gone large scale yet, but we haven't found any
10:14:20 7 problems. So we're not putting the herbicides
10:14:24 8 and insecticides on, so we're reducing the input
10:14:24 9 use on that and we're trying to create a
10:14:26 10 feedstock that is low input because we know that
10:14:32 11 we have to keep the cost of that feedstock down
10:14:36 12 in order for it to be anywhere near competitive
10:14:38 13 with other feedstocks.

10:14:42 14 MR. THRAILKILL: I assume that water is
10:14:44 15 the --

10:14:46 16 DR. ENGLISH: As far as water
10:14:48 17 conversion in the plant -- well, the technology
10:14:50 18 to convert switchgrass to ethenol is not a
10:14:54 19 known factor yet. So we don't know really what
10:14:56 20 the water use will be and whether it will be a
10:14:58 21 closed system or an open system.

22 MR. DEPRIEST: I have a question for
10:15:06 23 Mr. Holt. Could you elaborate a bit more about
10:15:08 24 the in-stream turbine that you mentioned in your
25 presentation?

10:15:12 1 MR. HOLT: Well, there are turbines
10:15:14 2 that -- I guess one way you could think about
10:15:16 3 them is like a small propellor that's enclosed
10:15:22 4 or a small -- you know, there are different
10:15:26 5 designs. But simply they're run of the river
10:15:30 6 type of generators that are either suspended or
10:15:34 7 anchored in the river to generate not as large
10:15:40 8 quantities as you would get from impoundment
10:15:44 9 with a high head, but certainly that's how you
10:15:48 10 can squeeze additional energy out of the river.
10:15:50 11 I'm not the technology guy. Maybe you should go
10:15:52 12 back to Stan Bull and ask him about that. But
10:15:56 13 that's what I've seen pictures of.

10:16:00 14 MR. FRANCIS: We have time for one more
10:16:02 15 question.

10:16:08 16 MR. DEPRIEST: This is for Dr. English.
10:16:10 17 Is sorghum a viable product for biomass and how
10:16:12 18 would that stack up against switchgrass?

10:16:16 19 DR. ENGLISH: Sorghum is an annual
10:16:20 20 crop. It would require more inputs than
10:16:24 21 switchgrass. Its per acre tonnage would
10:16:26 22 probably be less than switchgrass as it's
10:16:30 23 developed. However, as a liquid fuel crop, yes,
10:16:34 24 it's certainly being looked at and being
10:16:36 25 utilized in the West. As a crop that you cut

10:16:42 1 and burn for electricity, it would work as well
10:16:46 2 as switchgrass in that process, but you'd get
10:16:50 3 less tons per acre, I believe, off of it.

4 MR. FRANCIS: The Chairman wants
5 another question over there.

6 MR. BOTTORFF: No, I don't need another
10:17:02 7 question.

10:17:02 8 MR. SANSOM: Where are you with -- we
10:17:04 9 read about the UT switchgrass. Tell us how far
10:17:08 10 along you are with that.

10:17:10 11 DR. ENGLISH: Okay. The Tennessee
10:17:12 12 Biofuels Initiative developed by the State
10:17:16 13 provides money for constructing an ethenol, a
10:17:20 14 pilot -- not really a -- a one-tenth scale plant
10:17:26 15 in East Tennessee. It's a re -- it's designed
10:17:28 16 as a research/commercial plant and negotiations
10:17:34 17 are still progressing with Mascoma on that. I
10:17:40 18 don't know where they are in that process. We
10:17:42 19 have contracted with 16 farmers to grow
10:17:46 20 switchgrass this first -- this year. We're
10:17:50 21 going to put in 725 acres of switchgrass.

10:17:56 22 Switchgrass seed is tight, so we've
10:17:58 23 contracted to grow the switchgrass seed in Texas
10:18:02 24 and they're providing -- you know, we con -- put
10:18:06 25 the contract in place last August, they put the

10:18:08 1 crop in, so we will only get about enough of
10:18:14 2 those 700 acres this year and then we'll get
10:18:18 3 enough for 2,000 acres the following year and
10:18:20 4 4,000 acres the third year. So in total we
10:18:24 5 think we'll be somewhere about 7,000 to 8,000
10:18:28 6 acres of switchgrass in three years providing
10:18:30 7 they plant, I think it was, 170 tons per day.

10:18:38 8 MR. FRANCIS: Thank you. Thank you
10:18:40 9 again to all members of the panel for their
10:18:42 10 comments. This concludes the environmental
10:18:44 11 panel. We'll take a 10-minute break and then we
10:18:46 12 have two more panels to conclude today and then
10:18:52 13 we'll have public comments.

10:29:22 14 (A break was taken.)

10:29:24 15 MR. FRANCIS: The focus of this panel
10:29:26 16 is on renewable energy industry and
10:29:28 17 technologies. Members of the panel are Stuart
18 Dalton, Director for Generation at the Electric
19 Power Research Institute, Randy Johnson, Senior
20 Director at Sharp USA Memphis, John Jones,
21 Senior Vice President of Invenergy, LLC, and
22 Dr. Mark Downing, Group Leader of Biomass
23 Resources and Engineering Systems at the Oak
10:29:32 24 Ridge National Laboratory. Mr. Dalton.

10:30:02 25 MR. DALTON: Thank you. Mr. Chairman,

10:30:04 1 Members of the Board, I represent EPRI, a
10:30:06 2 non-profit collaborative organization conducting
10:30:08 3 electricity related R & D in the public
10:30:10 4 interest. Our members are public and private,
10:30:14 5 account for more than 90 percent of the kilowatt
10:30:16 6 hours sold in the U.S. and we serve more than
10:30:20 7 1,000 energy and governmental organizations in
10:30:22 8 more than 40 countries.

10:30:24 9 My comments are on the role we expect
10:30:26 10 renewable energy resources to play meeting
10:30:30 11 future electricity demand and in reducing CO2
10:30:34 12 emissions in the United States and Tennessee
10:30:36 13 Valley service area. For the future we see
10:30:38 14 uncertainty in fuel costs, in the level of
10:30:42 15 required reductions in CO2 emissions, and in how
10:30:44 16 climate change might affect issues including
10:30:48 17 plant cooling and performance.

10:30:50 18 In any likely scenario, we see
10:30:52 19 electricity's role in the future to grow
10:30:56 20 substantially. By 2050 we expect electricity
10:31:00 21 will grow from under 15 percent of the primary
10:31:04 22 energy today to 30 percent of total primary
10:31:08 23 energy in the U.S. Why? Because in our
10:31:14 24 evermore digital electronic society, it requires
10:31:18 25 flexibility, and electrotechnologies will take a

10:31:22 1 greater role, and because electricity will
10:31:26 2 support a shift from oil-based to electric
10:31:28 3 transportation.

10:31:30 4 Changes in the way we generate,
10:31:32 5 deliver, and consume electricity have the
10:31:34 6 greatest potential to reduce CO2 emissions.
7 EPRI's prism analysis, which has been widely
10:31:36 8 publicized, has shown electricity efficiency
10:31:42 9 improvements, as you talked about yesterday,
10:31:44 10 nuclear power, and low CO2-emitting coal
10:31:50 11 generation as well as plug-in hybrid vehicles
10:31:52 12 will reduce CO2 and, of course, the subject of
10:31:56 13 today's talk, deployment of renewable
10:32:00 14 electricity generation. This total can reduce
10:32:02 15 CO2 in 25 to 30 years.

10:32:04 16 Bringing CO2 reduction -- reducing
17 technologies to the mix likely will increase the
10:32:10 18 cost of electricity we believe by 150 percent.
10:32:14 19 Without investment in these technologies,
20 however, future cost for electricity and
10:32:20 21 emissions reduction could be four times higher.
10:32:20 22 We know that the technologies vary in the time
10:32:24 23 needed for development and the risk involved in
10:32:26 24 successful deployment. The recommended strategy
10:32:30 25 is to continue to search for new, low, and

10:32:32 1 non-emitting generations while keeping all known
10:32:34 2 options in the mix.

10:32:38 3 There are significant wind, solar,
4 geothermal, biomass and water power resources in
5 the country. However, they are not uniformly
10:32:44 6 distributed. We've heard about that from
10:32:46 7 earlier panels. The wind resources in TVA's
10:32:50 8 area generally are not economical for most areas
10:32:56 9 because of low average wind speeds. Geothermal
10:33:00 10 resources we heard about are also limited,
10:33:02 11 especially in the near surface areas. Solar
10:33:06 12 resources are better distributed. Though
10:33:08 13 Phoenix and Albuquerque, as an example, measure
10:33:10 14 about 1.5 times greater solar insulation -- or
10:33:16 15 solar radiation than Nashville. And the
10:33:18 16 potential for large scale solar deployment is
10:33:20 17 some 10 to 20 years away.

10:33:26 18 In the TVA area, hydropower
19 modernization has led to the largest recent
10:33:28 20 increase in renewable energy production. O & M
10:33:34 21 improvements are ongoing, but large scale
22 hydropower is not easily expanded.

23 Consequently, the bulk of my remarks
10:33:38 24 will be directed to biomass. This does not mean
10:33:40 25 TVA should abandon evaluation of other renewable

10:33:44 1 options. It simply reflects our analysis that
10:33:48 2 shows biomass is the strongest near term
10:33:52 3 regional.

4 The biomass picture is large,
10:33:54 5 complicated, and very clearly defined due to a
10:33:56 6 variety of factors. A large number of the uses
10:34:04 7 of biomass resources -- there are a large number
10:34:06 8 of resources and conflicting environmental
10:34:08 9 profiles for their use of each one. Competition
10:34:12 10 for available biomass is among food, liquid
10:34:18 11 fuels, electric energy, soil amendments,
10:34:18 12 building supplies, and other products.

10:34:22 13 Vastly different types of biomass
10:34:24 14 ranging from manure to crop waste to industrial
10:34:26 15 byproducts and sustainable energy plantations
10:34:30 16 growing biomass all might be possible. A wide
10:34:34 17 variety of technologies are available for
10:34:36 18 converting them to energy. Waste management and
10:34:38 19 land use will dictate some of the policies.

10:34:44 20 There are multiple pathways open to TVA
10:34:46 21 for converting biomass to electric power.
10:34:50 22 Chemical or biological production of fuel takes
10:34:50 23 two forms, gases or liquids. Gaseous fuels
24 result from the action of microorganisms which
25 produce methane, methane is burned in an

1 internal combustion engine or combustion turbine
10:35:04 2 coupled to an electric generator. The gas
10:35:04 3 typically is from landfills or anaerobic
10:35:08 4 digesters. This reduces greenhouse gas impact
10:35:10 5 significantly as methane would be burned.
10:35:12 6 However, the size of the generators is typically
10:35:16 7 a few megawatts at most, so the role in electric
10:35:18 8 generation is small.

10:35:18 9 Liquid biomass fuels such as biodiesel
10:35:22 10 and ethenol have been demonstrated in limited
10:35:26 11 electric power production, displacing oil and
10:35:26 12 boiler service and combustion turbines. Liquid
10:35:28 13 fuels tend to cost significantly more than solid
10:35:32 14 biomass fuels, so their direct role in
10:35:36 15 production is limited.

10:35:38 16 They will compete with transportation
10:35:40 17 fuels. Gasification of biomass with high
18 temperature steam, air or oxygen sometimes with
10:35:46 19 high pressures to produce gaseous products
20 including methane, carbon monoxide, carbon
10:35:48 21 dioxide and steam is one route. Pyrolysis which
10:35:52 22 is a partial gasification process may be used to
10:35:56 23 produce liquids. There are hundreds of
10:35:58 24 gasifiers installed around the world, but most
10:36:00 25 are very small and larger utility scale versions

10:36:04 1 are still developmental. EPRI, TVA, Southern
10:36:06 2 Company, and other organizations are currently
3 involved in research into biomass gasification
4 to reduce cost and improve performance.

10:36:14 5 Direct combustion of biomass, we've
10:36:16 6 heard about earlier, involves burning prepared
10:36:16 7 or sized biomass in conventional boilers. When
10:36:22 8 biomass is burned with another fuel, it's called
10:36:22 9 co-firing. Direct combustion can also be
10:36:26 10 accomplished with new dedicated combustion
10:36:30 11 systems or by retrofitting older systems.
10:36:30 12 Direct firing can occur in either fluidized bed
10:36:34 13 boilers, stoker boilers or, more rarely, a
10:36:36 14 pulverized fuel boiler such as is typical in the
10:36:40 15 TVA system.

16 Worldwide biomass power stations of
17 these types range from a few 10's of megawatts
10:36:46 18 to over 200 megawatts. Their size, combined
10:36:46 19 with the substantial experience base, makes
10:36:50 20 direct combustion a reasonable choice for
10:36:52 21 utilities such as TVA seeking a larger role in
10:36:56 22 renewable energy.

23 Amount the commonly consumed biomass
24 fields are wood, wood waste, straw, grasses, as
25 we heard about switchgrass, poultry litter and

10:37:04 1 municipal solid waste. TVA has played a
10:37:06 2 significant role in the domestic development of
10:37:10 3 co-firing, working with EPRI, DOE and others to
10:37:12 4 test concepts at the Allen, Culbert, and
10:37:16 5 Kingston Fossil Plants.

6 Biomass co-firing often has been called
7 the low-hanging fruit of the renewable energy
10:37:22 8 world because only a small investment is
10:37:24 9 necessary and it can produce up to 15 percent of
10:37:26 10 the heat content in the boiler, although 10 to
10:37:30 11 -- 5 to 10 percent is typically the upper limit.

10:37:34 12 While most co-firing technology in near
13 commercial, there are unresolved technical
14 issues, including the impacts of DeNOx catalyst
10:37:40 15 life for those with -- those systems installed,
10:37:42 16 boiler fires, site corrosion, flash cells, and
10:37:44 17 utilization. The carbon footprint and
18 sustainability of all these generation
10:37:52 19 technologies is largely determined by the
10:37:52 20 characteristics of the biomass.

10:37:54 21 The TVA region is rich in biomass
10:37:58 22 resources, but the vast majority of those
10:38:00 23 resources are already in use. A 2003 EPRI TVA
24 study found that only 2 percent of the wood
25 byproducts were given away or landfilled. The

10:38:10 1 balance, some 400,000 tons, were being sold.

10:38:10 2 As another example, the poultry
10:38:12 3 industry in Northern Alabama and Mississippi
10:38:14 4 produces a byproduct, poultry litter, which we
10:38:18 5 heard about earlier which consists of bedding
10:38:20 6 material, detritus, and poultry manure. A
10:38:22 7 largest current use is in field amendments.
10:38:26 8 However, there's a growing pressure to find
9 other outlet for the material due to runoff
10 issues and buildup of phosphorous in the soils
10:38:32 11 may be an alternate energy source. So in the
10:38:34 12 not too distant future, burning poultry litter
10:38:38 13 might solve an environmental issue and provide a
10:38:40 14 renewable resource.

10:38:42 15 EPRI has looked at the overall
10:38:42 16 economics of future generation options under
10:38:44 17 different scenarios based on technologies, fuels
10:38:48 18 and emissions as well as related -- pardon me --
10:38:52 19 incentives and policies. As one example, if
10:38:54 20 there were a national goal to meet 50 percent of
10:38:56 21 electrical demand with renewable energy, some
10:38:58 22 regions would provide more and others less.

10:39:02 23 Trading is assumed to be allowed and
10:39:04 24 the cost of electricity increases in a
10:39:06 25 non-uniform way. In the case of the SERC region

10:39:08 1 and TVA region, which excludes Florida, the
10:39:12 2 largest electrical demand in the U.S., less than
10:39:14 3 9 percent of generation is expected from
10:39:18 4 renewable resources, and this is mostly biomass,
10:39:20 5 and wholesale costs may increase in our estimate
10:39:24 6 some 18 percent. The same case for Texas. The
10:39:28 7 ERCOT region results in a 24 percent increase
10:39:30 8 from renewables, wind -- mostly wind energy,
10:39:34 9 with a 12 percent cost of electricity increase.

10:39:36 10 In the short time available, it's not
10:39:38 11 possible to cover all the details of any of
10:39:42 12 these, including biomass. For further
10:39:44 13 information we'd refer you to many of the other
10:39:46 14 speakers and information from NREL, other
10:39:48 15 national labs, and something that's downloadable
10:39:50 16 from the web, the most recent -- pardon me --
10:39:54 17 the Summer 2007 EPRI Journal which featured
10:40:00 18 renewables as the cover article. Thank you.

10:40:02 19 MR. FRANCIS: Thank you, Mr. Dalton
10:40:04 20 Mr. Johnson.

10:40:06 21 MR. JOHNSON: Thank you. When I was a
10:40:08 22 junior engineer at Potomac Electric Power
10:40:12 23 Company at an introductory luncheon, I asked one
10:40:14 24 of the senior executives there what the goals of
10:40:14 25 the utility were and he looked at me for a

10:40:18 1 moment and he said, well, I don't think we have
10:40:20 2 any goals. Well, that was a long time ago, by
10:40:22 3 the way. Times have changed and it's a real
10:40:24 4 pleasure for me to sit in front of a Board who
10:40:28 5 not only has goals and clear strategy but is
10:40:34 6 open to listening to outsiders pontificate on
10:40:40 7 renewable energy and I appreciate the
10:40:42 8 opportunity.

10:40:42 9 When former Secretary of Treasury John
10:40:46 10 Snow visited our solar electric module
10:40:50 11 manufacturing facility in Memphis not so long
10:40:52 12 ago, one of his comments, paraphrased, was that
10:40:54 13 he had come expecting to see the future of solar
10:40:58 14 energy, but he said, the future is already here,
10:41:00 15 I see. Well, I certainly echo that thought that
10:41:02 16 solar energy is viable right now in the
10:41:06 17 appropriate installations.

10:41:08 18 Even though our Memphis production
10:41:10 19 facility is less than five years old, we've
10:41:14 20 expanded rapidly to become one of the largest
10:41:16 21 module producers in the nation, running three
10:41:18 22 shifts and employing hundreds of staff. We are
10:41:20 23 selling into residential and commercial
10:41:22 24 installations all around the U.S. and the U.S.
10:41:26 25 only, I would add. These are good jobs in an

10:41:28 1 industry that's growing so fast, we can't keep
10:41:32 2 up.

10:41:32 3 But before I speak more about how
10:41:34 4 strong the current solar market is and how much
10:41:38 5 progress has been made over the last decade, let
10:41:40 6 me try to present simply and clearly what I
10:41:40 7 believe the solar and related industries require
10:41:44 8 in terms of government and utility support and
9 why.

10:41:46 10 I believe it's a general consensus that
10:41:50 11 solar electric, or solar photovoltaic as it's
10:41:52 12 called, generation will be a key electricity
10:41:54 13 producer in the near future. There are no major
10:41:58 14 technological issues to be solved until a grid
10:42:00 15 penetration is orders of magnitude higher than
10:42:00 16 it is now. So the implication is that in order
10:42:04 17 to see greater use of solar and electric
10:42:08 18 generation, the problems to be solved are ones
10:42:10 19 that relate to economics. The question is how
10:42:12 20 can TVA best support the continuing cost
10:42:16 21 reduction and cumulative installation of solar
10:42:20 22 energy.

10:42:20 23 I suspect and I hope I am not going to
10:42:24 24 surprise you a lot with the directions that I
10:42:26 25 suggest. The solar industry needs support in

10:42:28 1 three fundamental areas, strong basic policies,
10:42:32 2 reasonable long-term incentives, and research
10:42:34 3 support. TVA has a very direct role in the
10:42:36 4 first two of those.

10:42:38 5 Examples of strong fundamental policies
10:42:42 6 include net metering agreements consistent and
10:42:46 7 reasonable in utility interconnection standards.
10:42:46 8 Reasonable long-term incentives include feed-in
10:42:50 9 tariffs that decline over time with reasonable
10:42:52 10 lifetimes. Healthy policy and long-term
10:42:56 11 incentives are not just good things the industry
10:43:00 12 would like to have. I wish I had a visual aid
10:43:02 13 to help me in this, but I think you can imagine,
10:43:06 14 there's a very clear chain of events that you
10:43:08 15 could see almost as a flowchart that accompany
10:43:14 16 initiatives in these areas.

10:43:16 17 Specifically what happens is incentives
10:43:20 18 lower perceived financial risks of growing solar
10:43:24 19 businesses by introducing a climate of
10:43:26 20 stability. That's the first step. That
10:43:28 21 lowering of perceived financial risk motivates
10:43:30 22 companies like Sharp to commit to major capital
10:43:32 23 expansion programs and has the potential also to
10:43:34 24 lower costs of capital, as well.

10:43:36 25 I mention Sharp not just as a

10:43:40 1 theoretical, offhand example. Since
10:43:42 2 establishing our facility in the U.S. in 2003,
10:43:44 3 the company has followed through on its
10:43:48 4 commitment to the plant, expanding more than
10:43:50 5 tenfold in just a few years to become the
10:43:52 6 largest solar module manufacturer in the U.S.
10:43:56 7 we have serious plans for continued growth in
10:43:58 8 the U.S. over the next five years, potentially
10:44:04 9 expanding even more rapidly in the next few
10:44:06 10 years than in the past to hopefully become one
10:44:10 11 of the largest solar manufacturing facilities in
10:44:12 12 the world. These are seriously considered plans
10:44:14 13 that I'm talking about. This isn't my own
10:44:16 14 speculation.

10:44:16 15 Sharp upper management is keeping a
10:44:18 16 careful watch on the investment environment here
10:44:22 17 and I guarantee you that policy and incentives
10:44:24 18 implemented in the near term will have a
10:44:28 19 substantial impact on those decisions. As a
10:44:34 20 Federal corporation with the authority to
10:44:36 21 establish electricity retailing regulations, TVA
10:44:38 22 should certainly be involved in some of the key
10:44:40 23 policy decisions affecting solar.

10:44:42 24 Net metering, for instance, is one
10:44:44 25 policy fundamental for which the TVA can be an

10:44:48 1 important advocate. Net metering is at its
10:44:52 2 essence an attempt to begin to level the playing
10:44:54 3 field for alternative energy sources. Only
10:44:58 4 seven states in the U.S. are still fully without
5 net metering and three of those, including
10:45:00 6 Tennessee, are in the TVA power service region
10:45:04 7 and I think this is an enormous opportunity
10:45:06 8 here. Likewise, the standardization of inter-
10:45:10 9 connection requirements and the assurance of
10:45:12 10 their fairness and affordability is another
10:45:14 11 important step that can be taken to make sure
10:45:16 12 solar has a basis from which to compete. IREC,
13 the Interstate Renewable Energy Council, for
10:45:22 14 instance, has developed a recommended set of
15 interconnection standards.

10:45:26 16 I see that Green Power Switch
10:45:28 17 Generation Partners Program as simultaneously
10:45:30 18 addressing both policy and incentives and I'm
10:45:34 19 very grateful for it. Sharp has taken advantage
10:45:38 20 of this program, building a small but
10:45:40 21 respectable 50 kilowatt solar array for
10:45:44 22 generation on our own property that will pay
10:45:44 23 back in a reasonable time frame. That's an
10:45:48 24 immediate physical demonstration that solar can
10:45:52 25 pay back within the lifetime of a facility in

10:45:56 1 Tennessee. I think that's notable for that.

10:45:58 2 This is my -- that's my graceful segue
10:46:02 3 into the issue of incentives. I believe
10:46:04 4 extension and expansion of the GPS Partners
10:46:08 5 Program is a powerful way to introduce renewable
10:46:10 6 generation into the region. What it is is
10:46:14 7 essentially the start of a feed-in tariff
10:46:18 8 program that one of the panelists was discussing
10:46:20 9 just a few minutes ago.

10:46:22 10 Lead users of solar in Memphis, for
10:46:24 11 instance, have taken advantage of this program
10:46:28 12 to lower their facility electric bills, create
10:46:28 13 publicly visible technology landmarks, and begin
10:46:30 14 to build the infrastructure that will be needed
10:46:34 15 to sustain the rapid growth in solar
10:46:36 16 installations that will occur in the TVA region
10:46:40 17 when solar energy comes close to parity with
18 traditional generation sources.

10:46:44 19 The installation of our own solar array
10:46:46 20 in Memphis, for instance, introduced a major
10:46:50 21 electrical contractor and a number of engineers
10:46:52 22 to solar technology for the first time. The
10:46:56 23 positive downstream effects of solar module
10:47:00 24 sales are tremendous. Green pricing programs
10:47:02 25 put the initiative for renewables installation

10:47:04 1 in the hands of individuals and corporate
10:47:08 2 entities which is a potentially very powerful
10:47:10 3 way of sparking market growth.

10:47:14 4 Which brings me to -- finally to
10:47:16 5 technology and cost prospects. Solar costs will
10:47:22 6 decrease and have been decreasing dramatically
10:47:24 7 over the last two decades as solar grows by two-
10:47:30 8 digit percentage increases every year. This was
10:47:34 9 the case -- the cost increases were the case
10:47:38 10 until very recently when shortages in
10:47:42 11 polysilicon, a key raw material in the silicon
10:47:46 12 solar cell manufacturing process, led to
10:47:46 13 leveling of module prices temporarily, then
10:47:50 14 modest price increases and product shortages.
10:47:54 15 Now with the construction of polysilicon plants
10:47:56 16 under way, most analysts expect to begin seeing
10:48:00 17 relief from shortages by next year.

10:48:02 18 I should add that proper long-term
10:48:06 19 incentives to manufacturers over the past decade
10:48:10 20 might have been able to help alleviate that
10:48:14 21 silicon shortage. Polysilicon manufacturing,
10:48:18 22 for instance, is a very capital intensive
10:48:22 23 process and financiers need assurance that a
10:48:30 24 market will be stable.

10:48:30 25 Meanwhile, other solar technologies are

10:48:32 1 making significant in-roads. So-called thin
2 film solar technologies have tremendous
10:48:40 3 potential for reducing module costs. In 2007 a
10:48:42 4 thin film solar module producer became the fifth
10:48:44 5 largest PV manufacturer in the world. That's a
10:48:50 6 major milestone. Sharp is committed to a 1
10:48:54 7 gigawatt, thin film solar plant in Japan and we
10:48:58 8 have at the moment over 15 megawatts of thin
10:49:00 9 film solar production in Japan.

10:49:02 10 Various thin film technologies have the
10:49:04 11 potential to decrease, first, order costs I
10:49:06 12 believe by an order of magnitude, even if
10:49:10 13 product warranties are somewhat reduced. Even
10:49:10 14 now some thin film PV manufacturers are claiming
10:49:14 15 costs approaching \$1 per rated watt.

10:49:18 16 The bottom line is that solar
10:49:20 17 installations have been expanding and continue
10:49:22 18 to expand at double digit rates. That will
10:49:26 19 certainly continue and solar electric
10:49:30 20 installations are nearing grid parity in many
10:49:30 21 regions. The role that TVA can play is to make
10:49:34 22 appropriate policy and incentive decisions to
10:49:36 23 help ensure that solar costs decline more
10:49:40 24 rapidly and that the infrastructure is prepared
10:49:44 25 to handle growth as it occurs in the service

10:49:46 1 region.

10:49:46 2 MR. FRANCIS: Thank you, Mr. Johnson.

10:49:50 3 Our next speaker is Mr. Jones.

10:49:54 4 MR. JONES: Thank you very much for the
10:49:56 5 opportunity to speak with you today. This has
10:49:58 6 been a big movement on your part and certainly I
10:50:00 7 think we've all seen the energy industry change
10:50:04 8 over the years that we've all been in it. With
10:50:06 9 my joining Invenergy a year and a half ago, I
10:50:10 10 wouldn't have fathomed how much would have
10:50:14 11 changed in just that short time.

10:50:14 12 We've heard a lot of talk about biomass
10:50:18 13 and PV and other sources of renewables, but wind
10:50:22 14 has been the renewable resource for today. And
10:50:24 15 over the last few years, since we built the
10:50:28 16 Buffalo Mountain Project for you guys in 2004,
10:50:30 17 we've seen a marked increase in wind generation
10:50:34 18 across the country, where there's nearly
10:50:36 19 17,000 megawatts of installed wind in the United
10:50:40 20 States today with nearly 5,000 being built just
10:50:42 21 in the last year.

10:50:46 22 As you'll see in the presentation,
10:50:48 23 you'll see a wind intensity map across the
10:50:52 24 country. You see that the wind has been built
10:50:54 25 -- or wind generation has been built

10:50:56 1 predominantly where it's windy and that's --
10:50:58 2 we'll get into some of the challenges and ways
10:51:02 3 to address that later on.

10:51:02 4 But that growth has been reflected in
10:51:08 5 places like Invenergy where -- since we've built
10:51:08 6 Buffalo Mountain at 27 megawatts in '04, we've
10:51:12 7 got over 800 megawatts in operation by the end
10:51:14 8 of this month and continue to grow at about
10:51:16 9 700 megawatts a year.

10:51:20 10 And this growth is driven by a few
10:51:22 11 things. First of all, on a dollars per megawatt
10:51:28 12 hour basis, as a renewable resource, wind is
10:51:30 13 clearly the most cost competitive. Even in
10:51:34 14 tougher markets in the Southeast, as we'll talk
10:51:36 15 about later, delivered energy, you know, is in
10:51:38 16 the hundred dollar megawatt hour range and in
10:51:42 17 other windier areas of the country, it's
10:51:44 18 substantially less than that. Compared to PV at
10:51:48 19 3 or \$400 megawatt hour, solar thermal at, you
10:51:50 20 know, 120, \$130 a megawatt hour, it has a clear
10:51:54 21 cost advantage.

10:51:56 22 The other thing is is that the impacts
10:51:58 23 are a lot easier to describe to your customers.
10:52:02 24 You know, when we look at CO2 emissions, the CO2
10:52:08 25 emissions are zero. When you look at water

10:52:10 1 consumption, the water consumption is zero. So
10:52:10 2 it's really become kind of the trademark of
10:52:14 3 green power. You know, on everything from, you
10:52:16 4 know, your brochures for your green power
10:52:20 5 program to everything else, you don't really see
10:52:22 6 anything besides a wind turbine as far as
10:52:26 7 typifying a utility's objective to fill its
10:52:30 8 renewable requirements.

10:52:32 9 Now, in filling those renewables
10:52:34 10 requirements in an area where it's a little bit
10:52:36 11 tougher wind, you really have three options, one
10:52:38 12 of which you've already stepped in the right
10:52:40 13 direction and building within your fingerprint,
10:52:44 14 as you did with Buffalo Mountain, and I think
10:52:46 15 that that's the only project that's been built
10:52:48 16 in your service territory since that one. And
10:52:50 17 the challenge there has been cost.

10:52:54 18 Southeast is a little bit lower wind
10:52:56 19 area. The windiest spot is in the Appalachian
10:53:00 20 Mountains which is a tough place to drag an
10:53:04 21 18-wheeler with a wind turbine on it. So the
10:53:08 22 development costs and the construction cost is
10:53:08 23 high. The permeating difficulty is also high
10:53:10 24 due to people having visual impact concerns.
10:53:14 25 And so that's been a valuable option for you

10:53:18 1 guys in what you've done so far, but, you know,
10:53:20 2 it may, in fact, be the most expensive.

3 But there are some advantages to
10:53:24 4 building in your own footprint. First of all,
10:53:26 5 you guys have an extensive hydro resource, which
10:53:28 6 you can use to regulate the wind. The biggest
10:53:34 7 challenge of having a lot of wind on the system
10:53:36 8 is that it generates when it wants to. And for
10:53:38 9 folks that really don't have the kind of hydro
10:53:40 10 resource that you do, that can provide some
10:53:46 11 challenges on regulating the system, challenges
10:53:48 12 that you guys really don't have, and so that
10:53:50 13 gives you an advantage perhaps on a managed
10:53:54 14 megawatt hour basis on cost to where it does
10:53:58 15 make sense to build along those 45 miles of
10:53:58 16 ridge line.

10:53:58 17 The other thing is that it really gives
10:54:00 18 you a clear linkage with your customers. You
10:54:04 19 know, when you tell your customers about meeting
10:54:08 20 renewable energy goals, you can point to it, and
10:54:10 21 the further away it is, the tougher it is to
10:54:14 22 point to. I know that it's nice for you guys to
10:54:16 23 have access to that in Tennessee rather than in
10:54:20 24 Texas or someplace else.

10:54:20 25 But you do have a couple of other

10:54:22 1 options. The first is is you can bring it in
10:54:24 2 from adjacent areas. The trade-off there is
10:54:26 3 that you've got a little bit of a transmission
10:54:28 4 challenge, but when you look at MISO or PJM
10:54:32 5 just, you know, one wheel away, it's a lot
10:54:34 6 windier and the wind is in areas where it's a
10:54:36 7 lot flatter. So you get the dual benefit of
10:54:38 8 more energy for the dollars you're investing in
10:54:42 9 construction and the construction costs
10:54:44 10 themselves are lower because you're taking the
10:54:46 11 turbine to a farm road, moving a football field
10:54:50 12 long crane across the field rather than
10:54:56 13 disassembling and reassembling cranes to go to
10:54:56 14 each ridge line location.

10:54:58 15 And as an example, the cost in that
10:55:00 16 area is around \$80 a megawatt hour. Of course,
10:55:02 17 you'd have to factor in what it would cost you
10:55:04 18 to upgrade transmission system to be able to do
10:55:08 19 that. But this is a model that's been promoted
10:55:10 20 both in Texas and in California where people
10:55:14 21 looked at the maps and said, well, our load is
10:55:18 22 over here, but the wind is over here, we ought
10:55:18 23 to do something to bridge that gap.

10:55:22 24 And as an example, Invenergy has 1200
25 megawatts of generation in late stage

10:55:28 1 development or construction in MISO and PJM in
10:55:30 2 areas from West Virginia across to Illinois,
10:55:34 3 where Southern Illinois is probably the best
10:55:38 4 resource for you folks in being able to bring it
10:55:40 5 into your system.

10:55:42 6 And then the last option is one that
10:55:42 7 one of the other panelists spoke of before is
10:55:46 8 buying renewable energy credits. Now, you lose
10:55:50 9 a little bit of linkage, but perhaps you have an
10:55:50 10 advantage on cost. If you look at the windier
10:55:54 11 areas, West Texas, the Dakotas, wherever, you
10:55:56 12 can buy voluntary energy credits to offset the
10:56:00 13 generation you have within your own system and
10:56:02 14 the cost for generating electricity in Texas is
10:56:04 15 around \$65 a megawatt hour. So you're able to
10:56:08 16 drive that down or you're able to buy renewable
10:56:14 17 energy credits, you know, Green-e certifiable
10:56:14 18 RECs, at between 5 or \$6 a megawatt hour. And
10:56:16 19 so when you roll that into the incremental cost
10:56:20 20 of energy on your own system, that may well be
10:56:20 21 the most cost effective way to achieve your
10:56:24 22 goals.

10:56:24 23 And one of the concern folks have is
10:56:26 24 that, you know, do my customers really believe
10:56:28 25 it. You know, if I buy Green-e tags, is that

10:56:30 1 really the same as having a turbine that they
10:56:34 2 can see up a hill? And it turns out that the
10:56:40 3 various audiences that you guys might speak to
10:56:42 4 about that have already accepted it. If you
10:56:44 5 look at the DOD, the DOD goes out for RFPs for
10:56:52 6 voluntary, renewable Green-e tags. If you look
10:56:52 7 at your own voluntary program, the Green Power
10:56:54 8 Switch, that's certified by Green-e which
10:56:56 9 certifies your program as actually coming from
10:57:00 10 renewable resources.

10:57:00 11 And if you look at what it is that we
10:57:02 12 would be selling, for example, out of our Texas
10:57:06 13 resources, again, it's a Green-e certifiable,
10:57:10 14 renewable energy credit, so it ties well with
10:57:12 15 both your customers who have already looked at
10:57:14 16 your Green Power Switch and with Federal
10:57:16 17 entities which are buying them to offset their
10:57:18 18 own electricity consumption right now.

10:57:22 19 Now, the one shortcoming of that
10:57:24 20 approach is that it really doesn't contribute to
10:57:26 21 your energy goals and so if you're not finding
10:57:30 22 the satisfaction through conservation and other
10:57:34 23 resources, then you still end up needing to make
10:57:36 24 choices on what you're going to build next. And
10:57:38 25 that's a trade-off that you would to the make.

10:57:40 1 But I think that this may well be the easiest
10:57:44 2 cost option.

10:57:48 3 In looking at the Green-e certifiable
10:57:50 4 renewable energy credits, you know, all we've
10:57:52 5 seen is gross from 500 million megawatt hours'
6 worth of credits sold in '05 to more than 12
10:57:56 7 million, I guess as one of the other panelists
10:57:58 8 spoke, in '06. And even within the Green-e
10:58:04 9 certification which allows for wind, solar,
10:58:08 10 biomass, hydro in different forms, what people
10:58:12 11 actually want to buy, whether it's, you know,
10:58:12 12 the Green Mountain Powers of the world, the
10:58:16 13 Community Energy of the world, or folks in your
10:58:18 14 chairs, wind is clearly the preferred source.

10:58:22 15 And so, you know, when I sell renewable
10:58:24 16 energy credits, we sell, you know, Green-e
10:58:28 17 certified Texas wind, for the most part. And,
10:58:30 18 you know, we generate about 2 million megawatt
10:58:34 19 hours' worth of wind in Texas every year.

10:58:36 20 So in summary, you know, we really have
10:58:38 21 the resource in wind between us who are serving
10:58:42 22 you now and other developers like us. It has
10:58:44 23 really been the renewable energy resource for
10:58:48 24 today and should be for the next several years
10:58:50 25 as some of the other technologies catch up

10:58:52 1 either on development of other resource or in
10:58:54 2 cost. It's preferred by customers, it's
10:58:58 3 accepted by regulators and can work with a
10:59:02 4 variety of strategies. You know, companies like
10:59:04 5 us could either build within your footprint, we
10:59:06 6 can build next to your footprint and wheel it in
10:59:10 7 to you, provided that we're able to work
10:59:12 8 together on building the transmission, or we
10:59:14 9 could -- you could support the renewable
10:59:16 10 development in other parts of the country where
10:59:18 11 the resource is stronger.

10:59:22 12 Invenergy is prepared to continue
13 working with you guys to help meet your goals
14 and would be happy to work with you in
10:59:26 15 developing a strategy to do that. Thank you.

10:59:30 16 MR. FRANCIS: Thank you, Mr. Jones.
10:59:30 17 Our final panelist for today is Dr. Mark
10:59:34 18 Downing.

10:59:38 19 MR. DOWNING: There's something either
10:59:38 20 really good or really bad about being last.
10:59:42 21 I'll let you decide. I'm Senior Research
10:59:44 22 Scientist at Oak Ridge National Laboratory, also
10:59:44 23 an agricultural economist. And the ORNL
10:59:50 24 bio-energy program that I am a part of provides
10:59:52 25 support to the Department of Energy's Office of

10:59:56 1 the Biomass Program and, of course, Oak Ridge
10:59:58 2 National Laboratory is managed by the Department
11:00:00 3 of Energy by UT -- Battelle. So I'm real
11:00:02 4 pleased to be here this morning and thank you
11:00:02 5 for the opportunity to address your renewable
11:00:06 6 energy strategies because I think there are
11:00:10 7 several.

11:00:10 8 TVA has a rich and diversified history
11:00:12 9 in the region. It's enabled a population to
11:00:16 10 develop and prosper in lifestyle, continuing
11:00:18 11 tradition and in commerce. And this abundant
11:00:22 12 lifestyle and diversification of opportunity is
11:00:22 13 really what I want to talk about for the next
11:00:24 14 few minutes.

11:00:26 15 It's possible that many people see the
11:00:28 16 TVA as a provider of coal-fired, nuclear,
11:00:32 17 hydropower, and wind power for the Valley. That
18 review, I think, fails to describe the potential
11:00:38 19 advantages of TVA not only as an energy provider
11:00:40 20 in a broader sense, but as a recreation
11:00:42 21 provider, steward of land and water and other
11:00:44 22 resources in a large part of the Southeast U.S.
11:00:48 23 that lots of people in the country take
11:00:50 24 advantage of.

11:00:52 25 The fact is that TVA, along with many

11:00:54 1 other federal, state and local entities
11:00:56 2 cooperatively provide a vast array of goods and
11:00:58 3 services and benefits to Valley residents and
11:01:00 4 others and some of these benefits are very
11:01:02 5 clearly measured by value accruing in the
11:01:06 6 marketplace while bestowing some more
11:01:12 7 hard-to-measure non-market values such as
11:01:14 8 environmental benefits.

11:01:14 9 The Department of Energy along with Oak
11:01:18 10 Ridge National Laboratory and other energy
11:01:20 11 laboratories are exploring many energy options
11:01:22 12 in the U.S. There are energy initiatives in
11:01:24 13 nuclear, renewable energy, clean coal, renewable
11:01:26 14 fuels just to name a few. These strategies are
11:01:30 15 an attempt to provide a secure, agile, flexible
11:01:34 16 and diverse energy, a series of energy options.
11:01:38 17 Renewable energy is only part of the package
11:01:40 18 which shows promise in providing environmental
11:01:40 19 benefits and energy security. I'll make the
11:01:44 20 case that any of a number of renewable energy
11:01:46 21 options are better than none because these
11:01:48 22 strategies permit Tennessee and Tennessee's
11:01:52 23 surrounding states to diversify their portfolio
11:01:54 24 of energy provision.

11:01:56 25 We have developed a really prosperous

11:01:58 1 economy based on oil, gas, coal, and there are
11:02:02 2 several strong indications that continue to rely
11:02:04 3 solely on these resources and may not let us
11:02:06 4 achieve long-term potential growth, development,
11:02:10 5 and a sustained level of prosperity that we're
11:02:14 6 accustomed to.

11:02:14 7 Just as we diversify our personal
11:02:18 8 investment portfolios, TVA has wisely chosen to
11:02:20 9 diverse its energy production sources, benefits
11:02:24 10 derived from coal, hydro, wind, methane, but
11:02:24 11 there's more. I think the TVA region is rich
11:02:28 12 with productive land, many agricultural and
11:02:32 13 forestry resources. To pursue a truly renewable
14 energy strategy in concert with our
11:02:38 15 non-renewable profile, it's valuable for this
11:02:38 16 region to contribute its part to the national
11:02:44 17 renewable energy strategy.

11:02:44 18 And there are costs and benefits of
19 doing so in a dynamic economy. Some of them are
11:02:48 20 tough to measure. There are costs -- because
11:02:50 21 it's a misnomer to consider any renewable energy
11:02:54 22 source or strategy to be without cost, without
11:02:56 23 increased cost, or just business as usual.
11:02:58 24 There are benefits, as well, and it's the
11:03:00 25 balance of these costs and benefits over the

11:03:02 1 status quo or other alternatives that TVA must
11:03:06 2 evaluate.

11:03:06 3 There are risks even with hydro,
11:03:10 4 especially noted after the drought in the
11:03:14 5 Southeast that continues. And drought will
11:03:14 6 affect renewable energy strategies as it affects
11:03:18 7 agricultural and forestry. So no options are
11:03:18 8 without risk. It's diversification with an
11:03:22 9 understanding of risk and risk management
11:03:24 10 strategies that elicits TVA to continue
11:03:26 11 providing diverse energy sources to the Valley.

11:03:30 12 I've been part of and watch with a
11:03:32 13 great deal of interest the pursuit of renewable
11:03:32 14 energy strategies at the state -- several state
11:03:36 15 and federal level. It's been a great and heated
11:03:38 16 and continued debate regarding pros and cons of
17 renewable portfolio standards, renewable fuel
18 standards, combinations of the two. The debate
19 is likely to continue for some time with regard
20 to the relative costs and benefits and to whom
11:03:52 21 these costs and benefits accrue.

11:03:54 22 Members of commerce enjoying profits in
11:03:58 23 current markets feel threatened. Others will
11:04:00 24 find opportunities in ag and forestry. Other
11:04:04 25 new technological advancements in renewable

11:04:04 1 energy are currently being researched,
11:04:08 2 demonstrated, and deployed at state and federal
11:04:10 3 levels.

11:04:10 4 This is an opportunity for the counties
11:04:12 5 that TVA -- as the TVA region to take advantage
11:04:16 6 of. I speak specifically of several options for
11:04:22 7 co-firing, available biomass resources with coal
11:04:24 8 and existing facilities which may serve to
11:04:26 9 alleviate, for example, forest fire threat,
11:04:28 10 increases actually the value of underutilized
11:04:32 11 forest materials not currently demanded in
11:04:34 12 markets, and really could decrease a level of
11:04:38 13 landfilling of separated and municipal solid
11:04:42 14 waste which many find objectionable.

11:04:42 15 It's an opportunity to appropriately
11:04:44 16 evaluate land use options in the Valley, to
11:04:48 17 continue to provide not only food, feed and
11:04:48 18 fiber but fuel as well from our rich land
11:04:50 19 resource in the manner that is compatible with
11:04:54 20 appropriate measurable environmental
11:04:56 21 stewardship.

11:04:56 22 The worldwide energy community is
11:05:00 23 sensing a great deal of excitement in
11:05:02 24 anticipation of exploring many different fuel
11:05:04 25 and power options. The Department of Energy is

11:05:06 1 investing heavily in renewable energy science,
11:05:10 2 research, technology deployment to support the
11:05:12 3 industrial development by buying down the risk
11:05:14 4 of these investment and new technologies.

11:05:16 5 More than a dozen years ago, TVA
11:05:20 6 invested resources to understand the opportunity
11:05:20 7 for procuring biomass feedstocks in the Valley
11:05:24 8 to co-fire in some of their existing coal-fired
9 power plants. EPRI was involved in that,
11:05:28 10 Department of Energy, and many other agencies.
11:05:32 11 Co-firing is no longer researched. It's a
11:05:34 12 proven technology with some caveats waiting for
11:05:36 13 adoption and adaptation for specific plants.

11:05:40 14 Many power plants in this country
11:05:40 15 currently co-fire or even dedicated biomass
11:05:44 16 power plants and even a dozen years ago TVA saw
11:05:46 17 that wisdom and actually the diversification
11:05:50 18 aspects. Diversification means nuclear, solar,
11:05:52 19 wind, landfill methane, biomass derived power
11:05:54 20 and other options. And, in fact, the Energy
11:05:58 21 Independence and Security Act of 2007 provides
11:06:00 22 for capturing renewable energy benefits from
11:06:04 23 biomass power plants that support electric needs
11:06:06 24 for the bio-refineries.

25 Renewable energy is only part of the

11:06:10 1 answer to diversified energy portfolio, though.
11:06:12 2 There are two parts to the story. First is
11:06:16 3 renewable energy doesn't happen without
11:06:18 4 cooperation and collaboration from federal,
11:06:20 5 state, and local agencies and with industry. It
11:06:22 6 doesn't happen without private industry with
11:06:24 7 private capital investment. In every part of
11:06:26 8 the country where renewable energy solutions are
11:06:28 9 being used and are successful, there are multi-
11:06:30 10 jurisdiction and multi-agency levels of
11:06:34 11 cooperation.

11:06:34 12 It's cooperation between federal
11:06:36 13 agricultural and forest policy. There are
11:06:38 14 benefits to land owners and rate payers alike.
11:06:42 15 If you subscribe to some level of understanding
11:06:44 16 of some level of changing local or global
11:06:48 17 climate, there's not a time to argue about how
11:06:54 18 fast or how slow things are changing, just a
11:06:54 19 cooperative and collaborative recognition that
11:06:56 20 not only will renewable energy have an effect on
11:06:56 21 this change and the rate of change, but that
11:07:00 22 global and local climate change will have an
11:07:02 23 effect on ag and forestry and other markets for
11:07:04 24 biomass-derived material. So it works both
11:07:08 25 ways.

11:07:08 1 But I've still only told you half the
11:07:10 2 story. The other half of the story is energy
11:07:12 3 efficiency. Energy efficiency is not reduced to
11:07:16 4 a discussion of cost per gallon at the gas pump,
11:07:18 5 it's not reduced to whether you should turn the
11:07:22 6 thermostat down in the winter or up in the
11:07:22 7 summer or whichever way you need to do it. It's
11:07:26 8 about providing energy efficient alternatives in
11:07:28 9 housing design, materials, efficiency and
11:07:32 10 availability of alliances. And if we ever think
11:07:32 11 of plugging electric vehicles into the grid,
11:07:36 12 it's about making them efficient, as well.

11:07:38 13 So TVA has spent years thinking about
11:07:40 14 power choices, recreational opportunities for
15 people, land use benefits and opportunities for
11:07:46 16 change and I submit to you that these options
11:07:48 17 and opportunities should be made in concert with
11:07:50 18 both demanders and suppliers of these goods and
11:07:54 19 services and opportunities.

11:07:54 20 The State of Tennessee is investing
11:07:56 21 heavily in the Tennessee biofuels initiative and
11:08:00 22 I believe other neighboring states are paying
11:08:02 23 attention and may follow Tennessee's lead. And
11:08:04 24 this is important because not only do
11:08:06 25 Tennesseans benefit, but the environmental

11:08:08 1 choices Tennessee makes affects the environments
11:08:10 2 of the neighboring states, as well, and the
11:08:12 3 commerce of neighboring states will benefit.
11:08:16 4 Diversification of energy strategies in other
11:08:18 5 states will also benefit the TVA region.

11:08:22 6 The University of Tennessee, Oak Ridge
11:08:22 7 National Laboratory and many federal, state, and
11:08:24 8 local agencies and organizations are poised and
11:08:28 9 will continue to assist you in your endeavors to
11:08:30 10 design near-, mid- and long-term strategies
11:08:34 11 providing multiple benefits to the Southeast
11:08:36 12 U.S. through renewable energy options. Thank
11:08:38 13 you for your time.

11:08:40 14 MR. FRANCIS: Thank you, Dr. Downing.
11:08:42 15 At this time, the Board may have questions of
11:08:44 16 the panel.

11:08:52 17 MR. BOTTORFF: Mr. Dalton, I was
11:08:52 18 interested in your comments about there's
11:08:56 19 significant wind, solar, geothermal, biomass and
11:08:56 20 water power resources available in the country,
11:08:58 21 however, these are not uniformly distributed,
11:09:00 22 and then you went into a really, I thought --
11:09:04 23 anyway, I was impressed analysis of what might
11:09:08 24 be available to TVA. We have to, through this
11:09:14 25 process, set an appropriate goal for where we

11:09:18 1 think we can get to in terms of renewables as a
11:09:22 2 percentage at TVA. Based upon some of your
11:09:28 3 thoughts, do you have any -- or some of your
11:09:32 4 analyses, do you have any thoughts about what
11:09:34 5 might be a reasonable goal for TVA given the
11:09:38 6 resources that might be available to us in this
11:09:40 7 region? And let's pick a year 10 years from
11:09:44 8 now, let's say.

11:09:50 9 MR. DALTON: Ten years from now, of
11:09:50 10 course, is both harder and easier to predict
11:09:54 11 than 30 years from now. One of the things that
11:09:56 12 we've seen is that just as was discussed by this
11:10:00 13 panel, if you buy the credit from another area
11:10:04 14 that might have a lower cost of production,
11:10:06 15 that's one issue. If you try and generate it
11:10:08 16 within, you're really dependent on the resources
11:10:12 17 within the region.

11:10:12 18 MR. BOTTORFF: I want to generate it
11:10:14 19 from within. It looks like to me you're
20 throwing money away to go give it to somebody
21 else.

22 MR. DALTON: It's going to be pretty
23 hard --

11:10:18 24 MR. BOTTORFF: We call that a social
11:10:18 25 contribution or something.

11:10:22 1 MR. DALTON: Then it's going to be
11:10:22 2 pretty hard to get, for instance, deep
11:10:26 3 geothermal or hot rock resources up and get them
11:10:28 4 to the surface in the next 10 years, as an
11:10:30 5 example. I said that from 10 to maybe 15 or
11:10:36 6 20 years before you're really seeing some of the
11:10:38 7 large scale solar. If you look at a map of the
11:10:40 8 U.S., there's sort of a red heart. It's the
11:10:44 9 high insulation and high direct insulation areas
11:10:46 10 in the desert Southwest. It's not just the
11:10:48 11 amount of sunlight, but how many clouds come
11:10:52 12 over, the humidity, haze and other issues.

11:10:56 13 And, for instance, Florida which was
11:11:00 14 referred to as a relatively high area gets about
11:11:00 15 60 percent of the direct insulation, meaning
11:11:04 16 direct normal, the kind of things that if you
11:11:04 17 put a lens and try and focus it on an area, it
11:11:10 18 won't focus if you have clouds. You can get
11:11:12 19 some PV. So PV might be out there in 10 years
11:11:16 20 in small amounts, getting a large solar
11:11:20 21 installation in 10 years. Going to be pretty
11:11:22 22 hard to get the good, economic resources.

11:11:26 23 For biomass you're probably talking
11:11:30 24 about things like collection, consistency and
11:11:32 25 storage. Collection meaning a radius of

11:11:34 1 collection around any area where you might want
11:11:36 2 to use it for biomass burning. You start to get
11:11:40 3 uneconomical and use a lot of resources for the
11:11:44 4 fuel to get it to a collection point. So you're
11:11:46 5 looking for consistency of the resource, the
11:11:50 6 preparation and the storage and collection.

11:11:52 7 We think, as our modeling has shown in
11:11:56 8 the Southeast and specifically the TVA region,
11:12:00 9 you're probably -- if you had a 15 percent
11:12:02 10 resource, it's going to be very hard to meet
11:12:04 11 that economically inside the region. We
11:12:08 12 projected about a 9 percent impact and, in
11:12:14 13 effect, it coming from other areas through
11:12:16 14 transmission, as we've heard, or through
11:12:18 15 exchange from other areas. And it might still
11:12:22 16 be a bit more expensive to get that amount.

11:12:26 17 MR. BOTTORFF: And that's 9 percent by
11:12:28 18 when?

11:12:30 19 MR. DALTON: That was by 2030.

20 MR. BOTTORFF: By 2030.

21 MR. DALTON: Yes.

22 MR. BOTTORFF: Thank you.

11:12:38 23 MR. DALTON: That is non-hydro, by the
11:12:40 24 way.

11:12:42 25 MR. BOTTORFF: Yeah. Uh-huh.

11:12:42 1 MR. SANSOM: Randy, I've got kind of
11:12:44 2 two questions. One is you're talking about
11:12:46 3 solar for generating for TVA power and then I
11:12:50 4 want to ask you first about solar as an
11:12:52 5 individual homeowner that might put a solar
11:12:56 6 system in. And that might come from a little
11:12:58 7 bit of help yesterday out of conservation. Do
11:13:02 8 you all package those -- do you have the water
11:13:04 9 tanks? Do you have everything that goes or are
11:13:06 10 you just making solar panels? What's Sharp
11:13:08 11 making?

11:13:10 12 MR. JOHNSON: I'll just clarify. We
11:13:10 13 don't work in solar thermal, we don't work in
11:13:14 14 solar domestic hot water. We work with solar
11:13:18 15 electric panels, that is, solar photovoltaics,
11:13:20 16 and flat panels. We also -- Sharp works in
11:13:24 17 solar concentrator systems based on photovoltaic
11:13:30 18 cells and we work in thin film solar
11:13:34 19 photovoltaics. I think the strength -- for PVA
11:13:38 20 the strength of solar -- this is what we sell
11:13:40 21 into. We sell into the customer side of the
11:13:44 22 meter. That's where the strength of PVA is --
11:13:44 23 of PV is in the near term and where it's going
11:13:50 24 to be for the next few years. That's where it
11:13:52 25 makes sense as a distributed generation source.

11:13:56 1 It doesn't mean it has to be a small
11:13:58 2 percentage of the renewables installed. It can
11:14:02 3 be very very powerful if the incentives are
11:14:04 4 structured right and as costs come down very
11:14:08 5 quickly. So I see that. And even though direct
11:14:12 6 solar radiation resources here are not high, we
11:14:16 7 should not think of solar as a Southwest U.S.
11:14:20 8 technology. It's a nationwide technology and I
11:14:22 9 think it has immense potential and the resource
11:14:24 10 in this area is very significant.

11:14:30 11 MR. SANSOM: One thing I've -- I'm
11:14:30 12 going to get Tom to help me with this one. But
11:14:32 13 you said that had 4.50 per watt; right? That
11:14:38 14 was the number -- is that what you said?

11:14:44 15 MR. JOHNSON: That is a -- that's what
11:14:44 16 we're looking to be in terms of installed costs
11:14:46 17 in 2010. That was an example I believe I gave
11:14:54 18 with respect to New York state and at that cost
11:14:54 19 it's approaching great parity there. And at
11:14:58 20 that point, the RPS system -- the RPS programs
11:15:04 21 become almost a moot point as you start to
11:15:08 22 exceed that. You see, for instance, in Long
11:15:10 23 Island right now with the incentives that LIILCO
11:15:12 24 has in place, PV installations have been
11:15:18 25 exploding over the last several years because

11:15:22 1 their cost of electricity that demand side --
11:15:24 2 customer side is so high. That's a very
11:15:26 3 powerful way --

11:15:28 4 MR. SANSOM: Yeah, but you're not
11:15:30 5 answering my --

6 MR. JOHNSON: Sorry.

11:15:30 7 MR. SANSOM: What I'd like -- I'd like
11:15:32 8 for the people to understand the gap here. If
11:15:34 9 you say 4.50 per watt, I'm going to ask Tom
11:15:38 10 Kilgore to move that decimal place around for
11:15:42 11 me. But I think people understand really the
11:15:44 12 gap between what we charge for -- I hear
11:15:46 13 California and I hear New York, but we're here
11:15:50 14 and I'd like to -- Tom, help me to moving that
11:15:54 15 price to what we're doing.

11:15:54 16 MR. KILGORE: Our average embedded cost
11:15:58 17 would probably be about 80 cents per watt
11:16:02 18 because we'd be about \$800 per kilowatt. So
11:16:08 19 that's the comparison for our embedded cost. So
11:16:08 20 that's how much gap there is now. Would you
11:16:10 21 agree with that, Randy? Does that sound about
11:16:12 22 right?

11:16:12 23 MR. JOHNSON: It's a substantial gap.
11:16:14 24 Now, that doesn't mean that with programs like
11:16:18 25 the one that we're undertaking at SMCA where

11:16:20 1 we've installed their own solar array that we
11:16:24 2 can't have payback. We have payback in under 10
11:16:24 3 years utilizing your Generation Partners
11:16:28 4 Program.

11:16:28 5 MR. THRAILKILL: How much solar voltaic
11:16:32 6 -- photovoltaic is operational now either in the
11:16:36 7 U.S. or worldwide and how much do you think
11:16:36 8 there will be five years from now? Kind of
11:16:40 9 characterize what you see the market as being in
11:16:44 10 all of those combined forces.

11:16:46 11 MR. JOHNSON: I don't follow this
11:16:48 12 closely because I work a lot with just trying to
11:16:52 13 get things manufactured and designed and sold,
11:16:56 14 but I think we're just under a gigawatt
11:17:02 15 installation of solar now in the U.S. I think
11:17:04 16 folks are looking to the U.S. as the next big
11:17:06 17 market for solar. It has been because of
11:17:10 18 incentives, I think someone mentioned earlier,
11:17:12 19 Europe. It's been expanding at about a
11:17:16 20 30 percent growth rate over the last, I believe,
11:17:20 21 10 years. It's still expanding at a double
11:17:24 22 digit rate and I expect that to continue or
11:17:28 23 accelerate. Our plans for expansion at the
11:17:32 24 Memphis plant are evidence of that. We're
11:17:36 25 looking towards in the next few years maybe that

11:17:38 1 order of magnitude expansion.

11:17:48 2 MR. SANSOM: Stuart, this is probably
11:17:50 3 not -- if I understand what you do at EPRI, this
11:17:54 4 is not your area. But I'm curious about do you
11:17:54 5 do a lot of research on appliances, TV sets, the
11:17:58 6 consumption side? How do y'all -- how does that
11:18:00 7 get to the public? Do you know?

11:18:04 8 MR. DALTON: Well, unfortunately, it
11:18:06 9 isn't my area, but I will say that we have a
11:18:08 10 center now that's been created that lines up
11:18:14 11 different sorts of appliances and tries to get
11:18:16 12 out the word that if you buy a plasma versus an
11:18:20 13 LCD you're using more energy, as an example.
11:18:22 14 And a lot of us have been looking at that as we
11:18:24 15 look at U of T and others that are on the TV
11:18:30 16 sets.

11:18:30 17 But if you look at getting the word out
11:18:32 18 on efficiency, we use journal articles, we use
11:18:34 19 public presentations. Many of our reports are
11:18:38 20 in the public domain. One that's recently got a
11:18:42 21 lot press is on plug-in hybrid vehicles and
11:18:44 22 their impact on the electric sector and the
11:18:46 23 impact they can have on reducing CO2. That was
24 cosponsored by the Natural Resources Defense
11:18:52 25 Council and EPRI and got a little interesting

11:18:54 1 press in the USA Today in the last week, I know.
11:18:58 2 But we get it out a variety of different ways
11:19:00 3 and then we try and reinforce the messages in
11:19:04 4 presentations like this. Unfortunately, it is
11:19:06 5 not my area of expertise to give you a better
11:19:10 6 answer.

11:19:12 7 MR. BOTTORFF: I know each of you have
11:19:14 8 biases as to what the right renewable source is
11:19:18 9 for TVA. But if you could put your biases
11:19:22 10 aside, I'd be interested in you just going down
11:19:24 11 and if you could pick just one, pick just one,
11:19:28 12 which one would you pick that should be our
11:19:32 13 focus to try to -- our best opportunity.
11:19:36 14 Stuart, why don't we start with you because you
11:19:38 15 may not have as many biases as the guys on down
16 the table.

11:19:42 17 MR. DALTON: I don't know. I would
11:19:42 18 probably say you need all the options. But
11:19:46 19 since you asked for one, I would say the biomass
11:19:48 20 because of the richness of the resource in the
11:19:50 21 area.

11:19:52 22 MR. BOTTORFF: All right, Randy, this
11:19:52 23 will be interesting.

11:19:56 24 MR. JOHNSON: I almost can't answer
11:19:58 25 because you have to have a portfolio. You have

11:19:58 1 to attack many of them. But --

11:20:00 2 MR. BOTTORFF: Well, here is what I'm
11:20:02 3 going to say to you. If you couldn't pick
11:20:04 4 solar, which other one would you pick?

11:20:06 5 MR. JOHNSON: But even if I could pick
11:20:08 6 solar, I think I feel very strongly -- I'm
11:20:12 7 speaking personally as a professional here and
11:20:14 8 not necessarily for Sharp. I feel very strongly
11:20:18 9 that energy efficiency needs a very very
11:20:20 10 significant emphasis and I'm taking the liberty
11:20:26 11 to include that as a renewable resource here.

11:20:28 12 MR. BOTTORFF: So, John, if you
11:20:30 13 couldn't pick wind, what would you pick?

11:20:34 14 MR. JONES: I would actually agree with
11:20:36 15 him on energy efficiency. And I wanted to
11:20:40 16 address another question that you asked earlier
11:20:40 17 in that you asked a question of one of the other
11:20:42 18 panelists, what's possible, what could the goal
11:20:44 19 be.

11:20:44 20 With just a little bit of napkin math,
11:20:48 21 if you could build 200 megawatts of wind within
11:20:52 22 your territory, that would be about half a
11:20:52 23 million megawatt hours a year and so whatever
11:20:54 24 percentage that ends up being. And if you
11:20:56 25 looked at just kind of what we have in

11:21:02 1 development in MISO and PJM, that's about 1200
11:21:02 2 megawatts, a little windier. That's about
11:21:02 3 another 3 and a half million megawatt hours a
11:21:06 4 year.

11:21:06 5 You know, as far as what would you
11:21:08 6 pick, certainly efficiency works, certainly PV
11:21:14 7 works though there's a lot of supply constraints
11:21:18 8 which may make it not work soon, certainly
11:21:20 9 biomass works, but water use issues and CO2
11:21:24 10 issues are going to continue to be a challenge
11:21:26 11 for biomass, I think. So I'd agree with some of
11:21:30 12 the other panelists in saying that it really is
11:21:32 13 a portfolio solution. Though, as I indicated
11:21:34 14 earlier, the bulk of the energy that you can get
11:21:36 15 from that is probably from wind in the near
11:21:40 16 term.

11:21:42 17 MR. BOTTORFF: And, Mark, if you
11:21:42 18 couldn't pick biomass, what would you pick?

19 MR. DOWNING: If I couldn't pick
11:21:46 20 biomass? That's no fair. You know, Secretary
11:21:50 21 Bottorff, when he suggested we had a 30 percent
11:21:52 22 reduction in fuels by 2030 and did we have
11:21:56 23 enough biomass and we answered yes or
11:21:58 24 potentially could have enough biomass, I said,
11:22:00 25 you know, if you address the energy efficiency

11:22:04 1 issue, we wouldn't have to get there quite that
11:22:04 2 fast and quite that far. So that is the
11:22:06 3 picture.

11:22:08 4 But, you know, the biomass resources as
11:22:12 5 Burt English and I and several folks at the
11:22:14 6 National Laboratory looked at, there's some
11:22:16 7 available resources now you don't even have to
11:22:16 8 go out and plant and that's taking into account
11:22:20 9 the qualitative and quantitative aspects of what
11:22:24 10 happens to the land resource when you remove
11:22:28 11 those.

11:22:28 12 MR. BOTTORFF: So if you couldn't pick
11:22:30 13 biomass, you'd still pick biomass?

11:22:32 14 MR. DOWNING: Well, if I couldn't pick
15 biomass, I'd still pick biomass.

16 MR. JOHNSON: To be fair, I kind of set
17 that precedent.

11:22:36 18 MR. DOWNING: Yeah, but I was still
11:22:38 19 last.

20 MR. BOTTORFF: Did you have a question?

11:22:42 21 MR. DEPRIEST: Sure. Oak Ridge has
11:22:44 22 been working on fusion for 40 years or so. I
11:22:46 23 know this is a random question, but where do we
11:22:50 24 stand on fusion, if you know that information?

11:22:52 25 MR. DOWNING: I don't know the answer

11:22:52 1 to that. I can get you the answer. That's not
11:22:54 2 a problem. I hope folks in another 30 years
11:22:58 3 don't say that we've been working -- or 10 years
11:23:00 4 say that we've been working on biomass for 40
11:23:04 5 years, but, in fact, we have, and there's a lot
11:23:06 6 of work to do to get a lot of answers that not
11:23:08 7 only the public needs but that you need as an
11:23:10 8 entity. So I'd be happy to get back with you on
9 the fusion.

11:23:14 10 MR. DEPRIEST: I would appreciate it if
11:23:14 11 you would.

11:23:18 12 MR. FRANCIS: We're doing well on time.
11:23:20 13 If you have one or two more questions, we've got
11:23:22 14 time.

11:23:24 15 MR. BOTTORFF: I think we thank the
11:23:26 16 panel. It's been very educational and I
11:23:30 17 appreciate you taking the time and make the
11:23:30 18 stretch to help us understand a little bit
11:23:32 19 better what's in front of us. Thank you very
20 much.

11:23:36 21 MR. FRANCIS: That concludes our final
11:23:38 22 panel today. We've asked for the folks who are
11:23:40 23 going to speak to come down toward the front to
11:23:42 24 save time in getting to the microphone which is
11:23:44 25 in the middle of the room, and we've got an hour

11:23:46 1 to hear comments. I'll call folks two at a
11:23:52 2 time. The first is Edward Lollis. The
11:23:54 3 following person will be Kevin Rawson.

11:24:08 4 MR. LOLLIS: My name is Edward Lollis.
11:24:10 5 I represent the Tennessee Valley Unitarian
11:24:14 6 Universalist Church just a mile or two from
11:24:16 7 where we are right now. I'd like to read a
11:24:18 8 letter written by the chair of the church's
11:24:24 9 Environmental Concerns Committee, Mr. Eugene
11:24:28 10 Burr. He was here yesterday and would have
11:24:30 11 liked to have been here today but could not be,
11:24:32 12 so he's asked me to read this letter on his
11:24:34 13 behalf.

11:24:36 14 It's a privilege to have the
11:24:38 15 opportunity to address you, the members of the
11:24:40 16 TVA Board, today on behalf of the Environmental
11:24:44 17 Concerns Committee of the Tennessee Valley
11:24:46 18 Unitarian Universalist Church. Our concerns are
11:24:52 19 born -- oh, I'm sorry. The subject of this
11:24:54 20 letter is Green Power Switch. I'm addressing an
11:24:58 21 existing program, of course, of TVA.

11:25:02 22 Our concerns are born not out of
11:25:04 23 objections to the nature of the Green Power
11:25:06 24 Switch Program, but out of a sense of
11:25:10 25 disappointment and frustration that a program

11:25:12 1 that has the potential to deliver substantial
11:25:16 2 clean renewable energy to the region has
11:25:18 3 apparently suffered from inadequate and
11:25:22 4 unconvincing marketing efforts. Documentation
11:25:26 5 of performance must be systematic and objective
11:25:30 6 and communicating the results must be clear and
11:25:34 7 relevant to the philosophy of the program.

11:25:38 8 For several years the church has funded
11:25:42 9 its contribution to Green Power Switch strictly
11:25:46 10 by voluntary donations.

11 11 May I add parenthetically that our
11:25:50 12 church subscribes to 25 blocks of Green Power
11:25:50 13 Switch which is \$100 per month and it's done so
11:25:54 14 now for over seven years, so we've invested over
11:25:58 15 \$8,000 in voluntary contributions to TVA and
11:26:02 16 feel we are a stakeholder and have a stake in
11:26:06 17 knowing what the result of that investment has
11:26:08 18 been. That's a parenthetical expression.

11:26:10 19 But this year for the first time by
11:26:14 20 vote of the congregation on the recommendation
11:26:16 21 of the Environmental Committee, the contribution
11:26:18 22 is incorporated into the church budget, thereby
11:26:22 23 making support of Green Power a matter of church
11:26:26 24 policy. This requires, one, our better
11:26:30 25 understanding of how GPS performs, and, two, the

11:26:34 1 genuine transparency of its documentation both
11:26:38 2 through TVA's website and media releases.

11:26:44 3 We feel that in expressing this concern
11:26:46 4 we speak for the 2,369 customers who have
11:26:52 5 purchased 9,522 blocks of Green Power as well as
11:26:56 6 the thousands of others who are motivated to do
11:26:58 7 so but have been discouraged by the absence of
11:27:00 8 clear and verifiable information on the results
11:27:04 9 of GPS over the past seven years. To enhance
11:27:10 10 the marking of GPS, we urge you to make clear
11:27:14 11 the significance of certification by the Center
11:27:16 12 for Resource Solutions.

11:27:20 13 It would be a powerful and convincing
11:27:22 14 testament to the merit of the GPS program if TVA
11:27:26 15 were to augment the volunteer support with a
11:27:30 16 substantial investment in the clean renewable
11:27:32 17 energy sources that GPS was created to produce.
11:27:36 18 The strategic plan of TVA needs to acknowledge
11:27:40 19 GPS and to project its potential contribution if
11:27:44 20 TVA does, in fact, value the program as is often
11:27:48 21 stated. Signed Eugene Burr, AIA, AICP, Chair of
11:27:56 22 Environmental Concerns Committee, Tennessee
23 Valley Unitarian Universalist Church.

11:28:00 24 The date of the letter I've just read
11:28:02 25 is August 1, 2007. It might sound familiar

11:28:06 1 because Mr. Burr read it at a meeting of the
11:28:10 2 Board of Directors on that date here in
11:28:10 3 Knoxville. Since then the church has received
11:28:14 4 no reply in any form. We were expecting at
11:28:18 5 least an acknowledgement, not from the members
11:28:20 6 of the Board, but from TVA staff. I mentioned
11:28:24 7 existence of this letter to the GPS -- to two
11:28:28 8 GPS managers in September. They'd never heard
11:28:32 9 of it. Somehow the letter had not made it from
11:28:34 10 the Board of Directors down to whom I assume
11:28:38 11 would be the relevant people to reply, nor have
11:28:40 12 we in seven months noticed any measurable result
11:28:44 13 on the TVA website or in any other
11:28:48 14 documentation.

11:28:48 15 It's essentially a question of
11:28:50 16 transparency in getting to the stakeholders such
11:28:54 17 as us the results of seven years of experience
11:28:56 18 in the management of Green Power Switch.

11:28:58 19 MR. FRANCIS: Sir.

11:29:00 20 MR. LOLLIS: Thank you. I'm finished.
11:29:04 21 Thank you very much.

11:29:04 22 MR. THRAILKILL: Well, let me say, we
11:29:04 23 will answer your letter this time.

11:29:08 24 MR. LOLLIS: Thank you.

11:29:08 25 MR. FRANCIS: Kevin Rawson. He will be

11:29:10 1 followed by Stephen Levy.

11:29:18 2 MR. RAWSON: Good morning, sirs. I
11:29:20 3 appreciate the opportunity to address the Board
11:29:24 4 for the TVA. It's a privilege to do so. I'm
11:29:24 5 Kevin Rawson of the United States Navy. I work
11:29:26 6 for what they call Commander Naval Installations
11:29:30 7 Command. What we do is we run the bases for
11:29:32 8 shore facilities. My particular, I work for
11:29:36 9 Fleet and Family Services. We take care of the
11:29:40 10 Navy's fleet and family and part of the piece we
11:29:42 11 take care of is what we call Morale, Welfare and
11:29:44 12 Recreation. And I'm glad you all had a little
11:29:48 13 bit of fun because that's what we do. So I was
14 going to jazz y'all up, but you already had the
15 jokes and that's just fine.

11:29:52 16 Anyway, what our strategy is or my
11:29:54 17 strategy for implementation of energy
11:29:56 18 conservation and renewable resources is, first
11:29:58 19 of all, keep the awareness up high. And the way
11:30:02 20 we're going to do that is, first of all, put it
11:30:04 21 in our youth -- child and youth programs, is how
11:30:08 22 much energy we're using in each building. The
11:30:08 23 way we're going to do that is every day the
11:30:10 24 children will come into the child and youth
11:30:14 25 programs and know how many kWh's they consumed

11:30:16 1 the day before. So if they chose to leave some
11:30:18 2 light switches on or chose to reduce the
11:30:20 3 temperature, you know, during the summertime,
11:30:24 4 they'll know how many kW's that cost them. So
11:30:28 5 I'd encourage a program similar to that to be
11:30:30 6 put in the public schools and I say start early.
11:30:36 7 Not high school, not middle school, but
11:30:38 8 early, because at that point they could
11:30:40 9 embarrass their parents quicker, you know. My
11:30:42 10 third grader knows how many kWh's and some
11:30:46 11 people can't even read their own energy bills.
11:30:48 12 So I encourage that and I'll tell you how my
11:30:50 13 program is going because my program is very
11:30:50 14 early.
11:30:50 15 The second way we're going to do it as
11:30:52 16 well is put kWh meters in cottages. So when you
11:30:58 17 go into a cottage -- you can rent one from the
11:31:00 18 Navy -- at the end we'll give you a standard
11:31:00 19 bill and, oh, by the way, this is how much
11:31:02 20 energy you consumed by having your air
11:31:06 21 conditioner turned down to 58 degrees. We won't
11:31:08 22 increase cost initially, but we'll tell them by
11:31:10 23 making poor energy source, this is what you cost
11:31:12 24 us to run the building. Okay. We see that a
11:31:14 25 little bit in Europe already in some of the

11:31:16 1 vacation cottages and hotels. So that's energy
11:31:22 2 awareness and hopefully we'll spin off that some
11:31:24 3 energy conservation. And we do have to conform
4 to higher SEER levels when we do our buildings
5 anyway.

11:31:30 6 Secondly, I'd like to see energy
11:31:34 7 conservation renewables what I call conjoin
8 energy alternatives. And a conjoinment is where
9 you use a solar powered vehicle where it makes
11:31:46 10 sense and the first one we're going to do will
11:31:50 11 be golf cart solar powered systems. I didn't
11:31:52 12 contact Sharp yet. I will. We're in Millington
11:31:52 13 and I'll find them. Right now we're looking at
11:31:54 14 using an overseas participant. I'd prefer to
11:32:00 15 use Sharp.

11:32:00 16 So other conjoinments that are being
11:32:02 17 used are we use solar powered lights. The power
18 stores up in a battery and you light up a
19 parking lot and I see them in different places.
11:32:10 20 But you conjoin it or the distance from where
11:32:12 21 the alternative energy source is is shortened to
11:32:16 22 where it's used. It may not be even on your
11:32:18 23 grid. So, yep, how does TVA get paid for that?
11:32:20 24 Well, you don't.

11:32:22 25 And the third way is I want to

11:32:22 1 encourage nuclear power systems to be used. We
11:32:26 2 kind of danced on that a little bit, but nuclear
11:32:26 3 power is being used extremely well in the Navy.
11:32:30 4 We've only had one incident, no release was
11:32:32 5 done. But all aircraft carriers and submarines
11:32:34 6 are nuclear powered and that's the way we're
11:32:36 7 going to be. Thanks so much for your time, sir.

11:32:38 8 MR. FRANCIS: Stephen Levy. He'll be
11:32:40 9 followed by Bill Haynes.

11:32:44 10 MR. LEVY: Gentlemen, I've had
11:32:46 11 30 years' experience at IB Research Lab in power
11:32:50 12 generation. I was a former director of the EPRI
11:32:54 13 Power Electronics Center. A couple of things
11:32:56 14 I'd like to modify as to what was said about
11:33:00 15 solar.

11:33:00 16 First of all, the most promising solar
11:33:06 17 for residential is to combine your roof and
11:33:12 18 solar into one unit, in which case the price of
11:33:16 19 the roof is included in the price of the solar
11:33:18 20 and that can be mortgaged. So that's number
11:33:22 21 one.

11:33:22 22 Number two is that the problem appears
11:33:24 23 in the system to be that of peaking power costs.
11:33:28 24 And peaking power costs can be partly alleviated
11:33:32 25 through energy storage and energy storage for

11:33:36 1 TVA would be something like compressed air
11:33:40 2 storage. And I'm just wondering what's been
11:33:44 3 done in compressed air storage or even storage
11:33:46 4 in general, whether it be for residential with
11:33:52 5 eutectic energy storage to modify the
11:33:58 6 temperature profile in the home or the
11:34:02 7 distributed energy storage where we're talking
11:34:04 8 about battery or some fuel cell type storage.

11:34:08 9 So my issue is that I think that there
11:34:10 10 is a lot of issues out there, technical issues,
11:34:16 11 that are going to -- if properly addressed are
11:34:20 12 going to change the climb of the future growth
11:34:22 13 in this nation. So that's what I came here to
11:34:26 14 say. Thank you.

11:34:28 15 MR. FRANCIS: Bill Haynes. He'll be
11:34:30 16 follow by David Bolt.

17 MR. HAYNES: Howdy. I'm name is Bill
11:34:36 18 Haynes. I'd like to thank you for having us and
11:34:38 19 for the audience that showed up. I want to say
11:34:40 20 that the shortage of silicon is going to soon be
11:34:44 21 over and people are going to thin film
11:34:46 22 photovoltaics and I would encourage you all to
11:34:46 23 have the long-term rate in program and give
11:34:52 24 price guarantees.

11:34:52 25 And there's been a major breakthrough

11:34:54 1 in power electronics and it's going to be
2 announced in about 60 days. It was done at the
11:34:58 3 power electronic center at Virginia Tech. It
11:35:00 4 lowers the cost, extends the range, makes more
11:35:04 5 energy available from solar cells, and it's
11:35:06 6 going to continue to -- on the increase to
11:35:10 7 decrease dramatically the cost of solar energy.

11:35:14 8 And so I would just encourage you to
11:35:14 9 make a flexible program and to give long price
11:35:20 10 guarantees because every dollar we keep in the
11:35:22 11 United States generates tax money. And, as
11:35:24 12 Mr. Dalton said, for EPRI we need more vehicular
11:35:26 13 with electricity because we don't want to keep
11:35:30 14 funding the people who don't like us, hooked on
11:35:34 15 oil and stuff and producing pollution. Thank
11:35:38 16 you.

11:35:38 17 MR. FRANCIS: David Bolt. He'll be
11:35:40 18 followed by Grant King.

11:35:42 19 MR. BOLT: My name is David Bolt. I'm
11:35:44 20 founder of Sustainable Future, a company that
11:35:48 21 helps people move toward net zero energy. I
11:35:50 22 want to thank the TVA Board for their current
11:35:52 23 Generation Partners Program. Through that
11:35:54 24 program, I've been net zero energy for two years
11:35:58 25 now.

11:35:58 1 The reason I'm addressing the Board,
11:36:00 2 I'd like for them to consider a progressive rate
11:36:04 3 structure. And what this would do is allow --
11:36:06 4 first of all, encourage energy efficiency
11:36:10 5 because the more energy you use, the higher rate
11:36:14 6 you're paying per that incremental bill or
11:36:16 7 energy. The second thing it would do is
11:36:18 8 generate additional funds to fund things like
11:36:22 9 the Generator Partners Program. So, again, I
11:36:24 10 would like for you to consider a progressive
11:36:26 11 rate structure.

11:36:28 12 MR. FRANCIS: Grant King. He'll be
11:36:30 13 followed by Jim Davis.

11:36:34 14 MR. KING: It's been a very exciting
11:36:36 15 couple of days. This is like wrestling with a
11:36:38 16 big sack of snakes. You can't tell which one is
11:36:42 17 going to bite you and which one doesn't even
11:36:44 18 hurt.

11:36:44 19 I've heard exciting stuff. The
11:36:46 20 renewables is exciting in its promise, but it's
11:36:50 21 obvious the cost isn't sure, the eventual winner
11:36:52 22 isn't sure. As we just heard, in 60 days the
11:36:54 23 technology can change again. If you invested
11:36:58 24 heavily going in one direction, you could be in
11:37:02 25 the wrong boat to the wrong location.

11:37:04 1 There's a reality that's here right
11:37:04 2 now. Imagine a bucket, an old bucket with a
11:37:10 3 couple of small holes in the bottom and you're
11:37:10 4 pouring power in as fast as you can, but a good
11:37:12 5 part of it's leaking out. The technology and
11:37:16 6 cost of conserving energy is proven, it's
11:37:20 7 available, and it's things that TVA and Oak
11:37:24 8 Ridge National Labs have extensive experience
11:37:28 9 in. Insulation costs, proven low cost, rapid
11:37:32 10 payback and will pay back year after year into
11:37:36 11 the future irregardless of how you generate
11:37:38 12 power into the future.

11:37:40 13 I think anything you can do to help
11:37:42 14 people bridge the gap in initial construction,
11:37:46 15 to encourage better insulation and better energy
11:37:50 16 using products will not only pay back the TVA
11:37:52 17 but solve a problem now in terms of demand and
11:37:56 18 also help into the future.

11:38:00 19 The other thing that you have is
11:38:02 20 programs already in place for this type of
11:38:04 21 thing. You have a TVA Qualified Contractors
11:38:06 22 Program used by a number of your distributors in
11:38:10 23 which you have helped train contractors to
11:38:12 24 successfully install equipment to operate
11:38:16 25 properly. That could be expanded.

11:38:20 1 Education. Let's get to those kids
11:38:22 2 before their attitudes harden along with their
11:38:26 3 arteries and show them where the electricity
11:38:28 4 comes from, what demand really means. When you
11:38:30 5 talk about the possibility of doing demand
11:38:34 6 pricing for residential, you're also having the
11:38:36 7 additional effect of starting to educate people
11:38:40 8 on the realities of the cost of power
11:38:42 9 transmission. Everything you produce can't be
11:38:46 10 stored overnight for one night. I doubt if very
11:38:48 11 many people understand that at all.

11:38:50 12 I think that the other thing, it is a
11:38:56 13 very difficult question to face a consumer and
11:39:00 14 tell him to spend more on power when he's as
11:39:04 15 confused today as he is about what really saves
11:39:06 16 power, what really Green Switch means, what it
11:39:10 17 means to talk about solar on his home. And
11:39:16 18 he'll remember maybe 15 years ago when they put
11:39:16 19 solar units on his roof and some of those roofs
11:39:20 20 didn't hold the weight very properly, not
11:39:22 21 because of the lack of good intentions, but
11:39:24 22 maybe the technology wasn't ready at the time.

11:39:26 23 Anything you can do in terms of
11:39:28 24 education in schools, anything you can do to
11:39:32 25 train contractors, anything you can do to make

11:39:34 1 this acceptable to look at efficiency
11:39:38 2 immediately will help the immediate problem.
11:39:40 3 I don't think this is the right forum,
11:39:42 4 but there are changes coming in nuclear power
11:39:46 5 and I wonder how they will impact you. I don't
11:39:48 6 know much about that, but I've heard about the
11:39:50 7 type of reactors they're building in China and
11:39:54 8 South Africa and Germany called pebble reactors.
11:39:58 9 That's something I'd like to be able to have the
11:40:00 10 chance to learn from you about and in your
11:40:02 11 future plans. I appreciate your time and
11:40:04 12 opportunity, gentlemen.
11:40:06 13 MR. FRANCIS: Jim Davis. He'll be
11:40:06 14 followed by Ken Wilson.
11:40:14 15 MR. DAVIS: I'm Jim Davis. I work for
11:40:14 16 Tetra Tech in Oak Ridge. We're a national-wide
11:40:18 17 engineering and environmental consulting firm.
11:40:18 18 Thanks for your time. I just want to encourage
11:40:22 19 TVA to become a national leader in renewables.
11:40:24 20 I think that's a great opportunity for you to
11:40:26 21 take and to set aggressive goals in doing so.
11:40:30 22 I also want to continue to -- continue
11:40:34 23 the -- encourage you to continue the Green Power
11:40:36 24 Switch Generation Partners Program and in
11:40:40 25 particular to keep those rates the same and more

11:40:42 1 particularly the 20 cent per kilowatt hour for
11:40:48 2 commercial installations. This really makes
11:40:48 3 sense, particularly for solar, because the solar
11:40:54 4 peak coincides with your afternoon demand peak.
11:40:56 5 Finally, I would like to speak in support of the
11:40:56 6 feed-in tariff policy and would encourage you to
11:41:00 7 consider that. Thank you.

11:41:02 8 MR. FRANCIS: Ken Wilson. He'll be
9 followed by Brandon Blevins.

11:41:08 10 MR. WILSON: I'd like to read a
11:41:08 11 statement on behalf of Allen Gentry, Chairman
11:41:12 12 Elect, Technology Department, Cleveland State
11:41:16 13 Community College.

11:41:16 14 I regret that I'm not able to be there
11:41:18 15 in person today due to the ailments that are
11:41:20 16 afflicting many. That does not, however, lessen
11:41:24 17 my concern or interest in today's topics. As
11:41:26 18 TVA moves towards charting a path for its role
11:41:30 19 in the areas of energy efficiency and renewable
11:41:32 20 energy, I feel that I may have a unique
11:41:36 21 perspective drawing upon my 24 years of working
11:41:38 22 with the agency and my new endeavors of
11:41:40 23 instructing tomorrow's work force.

11:41:42 24 My experiences over the last 18 months
11:41:44 25 have been heavily focussed on energy efficiency

11:41:48 1 and renewable energy programs and technologies.
11:41:50 2 We have developed and implemented a zero energy
11:41:54 3 housing work force development certificate to
11:41:58 4 compliment our traditional construction
11:42:00 5 technology program. This program focuses on
11:42:02 6 building for efficiency of resources and energy
11:42:08 7 as well as the appropriate uses of the renewable
11:42:10 8 energy technology.

11:42:12 9 I can appreciate the dilemma TVA faces
11:42:16 10 trying to find the balance between sufficient
11:42:18 11 revenue to maintain operations, the interest of
11:42:20 12 stakeholders for uninterrupted power at
11:42:26 13 affordable rates, and the environmental impact
11:42:26 14 of those competing objectives. I hope that the
11:42:30 15 utility and the public can work hand in hand
11:42:34 16 toward meaningful solutions.

11:42:36 17 It is often stated that homes in the
11:42:38 18 Southeast are some of the least energy efficient
11:42:42 19 in the country based on electrical consumption.
11:42:44 20 This may not be entirely accurate. First, all
11:42:46 21 electric homes have been promoted for many years
11:42:50 22 using abundant and affordable electricity and
11:42:54 23 many other areas of the country use home heating
11:42:56 24 oil, natural gas, propane, wood, and coal as
11:43:00 25 other energy sources.

11:43:02 1 I think it would be a better measure to
11:43:04 2 calculate the total energy consumption from all
11:43:06 3 sources per square foot instead of kilowatt per
11:43:12 4 residence -- kilowatt hour per residence. That
11:43:12 5 would give us a better comparison as well as
11:43:14 6 show us the true impact of energy efficiency
11:43:18 7 improvements.

11:43:18 8 There's much to be gained from energy
11:43:22 9 efficiency. We have been stressing all the tech
11:43:24 10 -- all the technology and equipment in the world
11:43:24 11 will not be effective if not put into an
11:43:28 12 efficient environment. A return to core tenets
11:43:32 13 of years ago when TVA stressed energy efficient
11:43:32 14 environments would be most productive.

11:43:34 15 Many new products and materials are on
11:43:36 16 the market today to make that more of a reality
11:43:42 17 than in the past. Trusted and reliable sources
11:43:44 18 to validate the true effectiveness of these
11:43:46 19 items is also needed so that consumers are not
11:43:50 20 led astray by exaggerated market claims.

11:43:52 21 There are a few basic materials that
11:43:54 22 will work well to get results. Over the last
11:43:56 23 year, I have been making small incremental
11:44:02 24 improvements to my own home. Now, a year later,
11:44:04 25 with data from the same month last year, I see a

11:44:08 1 40 to 50 percent reduction in electrical
11:44:10 2 consumption and 20 to 25 percent reduction in
11:44:14 3 natural gas. This has been consistent over the
4 last two months.

11:44:18 5 We are also seeing the value of energy
6 efficient construction in Habitat For Humanity
11:44:24 7 homes that's not running up the costs. The
11:44:24 8 energy savings for Habitat homeowners has been
11:44:28 9 documented as saving them about two house
11:44:28 10 payments per year. Thank you.

11:44:32 11 MR. FRANCIS: Brandon Blevins. And the
11:44:34 12 next speak behind him will be Sarah Smith.

11:44:40 13 MR. BLEVINS: Thank you. I'm Brandon
11:44:42 14 Blevins. I'm the Wind Program Coordinator at
11:44:44 15 Southern Alliance for Clean Energy. My
11:44:46 16 responsibilities are the Tennessee Wind Working
11:44:50 17 Group, so I get to work here directly in TVA and
11:44:52 18 then also the Midatlantic Regional Wind Energy
11:44:54 19 Institute. My goal is to educate and outreach.
11:44:58 20 So I think anything that comes from this that
11:45:00 21 drives wind, I'll certainly be affected by it.

11:45:04 22 I think it was seven years ago you all
11:45:06 23 decided to build the Southeast's first and
11:45:08 24 currently only operating wind farm up on Buffalo
11:45:12 25 Mountain. You chose to expand that to 29

11:45:16 1 megawatts in 2004, but still it's not, from my
11:45:20 2 perspective, really giving you all an experience
11:45:22 3 in operating wind, how does it integrate on the
11:45:26 4 grid. I hope that 30 megawatts isn't kind of at
5 your margin.

11:45:30 6 But why I'm here is to encourage that
11:45:32 7 these last two days is really the future in
11:45:34 8 moving forward to gaining some of that
11:45:38 9 understanding of the knowledge and benefits of
11:45:40 10 wind. I'm certainly not going to encourage that
11:45:42 11 you build wind on every ridge top in Tennessee,
11:45:44 12 but nor am I going to say wait for low wind
13 speed turbine technology because I think that
11:45:48 14 technology is available today and at a low cost.

11:45:52 15 We've heard the benefits ranging from
11:45:54 16 CO2 emissions to water, but I want to bring the
11:45:58 17 customer perspective to you all. It's my hope
11:46:00 18 that TVA will own the generation assets from
11:46:02 19 wind as you develop it. I hope you choose to
11:46:04 20 develop a target that allows you to understand
11:46:08 21 how to operate the wind and it becomes an asset
11:46:10 22 in later years.

11:46:12 23 Understand that the drivers that are
11:46:14 24 currently situated towards corporations may have
11:46:16 25 a tax appetite to help with the wind cost. But

11:46:24 1 I hope that you're able to partner with them in
11:46:26 2 order for later on in the years that the cost of
11:46:30 3 wind goes down to only operation and
11:46:32 4 maintenance.

11:46:32 5 I also want to point out a case study
11:46:36 6 that I think is largely misunderstood in the
11:46:38 7 region. In 2002 or '3 when you all decided to
11:46:42 8 chose between Buffalo Mountain and Stone
11:46:46 9 Mountain, you chose Buffalo Mountain because
11:46:46 10 Stone Mountain had some opposition. We went
11:46:48 11 back there and did work about a year and a half
11:46:50 12 ago and the county got wind, they said they
11:46:54 13 wanted wind. We brought five developers in.
11:46:56 14 They passed 15 to zero original exemption for
15 wind turbines. This is in a much higher wind
16 class than the Buffalo Mountain project.

11:47:04 17 And I did some napkin math as well on
11:47:08 18 what economic impacts this might have on this
11:47:10 19 very rural community in Johnson County. A
11:47:12 20 50-megawatt wind farm, which is twenty-two .5
11:47:16 21 megawatt turbines or twenty-five 2 megawatt
11:47:18 22 turbines installed at the current average cost
11:47:20 23 across the nation at 1.6 million is an \$80
11:47:22 24 million project. With the property tax rate at
11:47:26 25 2 percent, that comes out to \$1.6 million as

11:47:30 1 property tax base. In the state of Tennessee,
11:47:32 2 there's a one-third assessed property tax value
11:47:38 3 to wind turbines bringing \$530,000 to the
11:47:40 4 community.

11:47:40 5 So I want to say as you form your
11:47:42 6 energy future and you think about wind, don't
11:47:44 7 think of the communities as a challenge and I
11:47:46 8 hope to work with you in going there. Thank
11:47:48 9 you.

11:47:50 10 MR. FRANCIS: Sarah Smith. John Noel
11:47:52 11 will be next.

11:47:56 12 MS. SMITH: Good morning. It's nice to
11:47:58 13 see all of you again and thank you so much for
11:48:00 14 this wonderful occasion. I just feel like a
11:48:04 15 sponge. I've been sitting here taking in all
11:48:04 16 this wonderful information. I know you're
11:48:06 17 probably on overload. But thank you. This is
11:48:08 18 just a wonderful event and we appreciate it very
11:48:10 19 much.

11:48:12 20 I've made a few notes as I was sitting
11:48:14 21 there. I didn't really intend to talk, but
11:48:16 22 there's just so much information and I know I'm
11:48:18 23 repeating probably a few things that have been
11:48:22 24 said. But it seems like if we could get, as it
11:48:24 25 was expressed yesterday, a massive public

11:48:30 1 awareness campaign out as soon as possible --
11:48:32 2 and I know we've talked about this a little
11:48:34 3 bit -- but that would be an immediate way to get
11:48:36 4 people aware, to start conserving, to start
11:48:40 5 using energy efficiency.

11:48:42 6 And I mean it really in the sense of
11:48:44 7 not just saying, here is what we need to do, but
11:48:46 8 showing real experience from real people around
11:48:50 9 our area who are actually doing this and build a
11:48:52 10 consciousness of this is a good thing. As that
11:48:54 11 consciousness builds, then people will make
11:48:56 12 their homes more energy efficient, where then we
11:49:00 13 can come in with this renewable energy in an
11:49:02 14 efficient home and use it to its best advantage.

11:49:04 15 Along that line, I would love to see
11:49:06 16 the Generation Partner Program -- which is a
11:49:10 17 wonderful program, it's the best thing going I
11:49:10 18 think right now -- to go on steroids, to become
11:49:14 19 an advanced generation partner. And perhaps in
11:49:18 20 that way that first of all if they want to take
11:49:20 21 part in this program, their home would first
11:49:22 22 have to meet a level of energy efficiency.
11:49:24 23 There's a 2006 -- let me see what it's called --
11:49:26 24 International Energy Conservation Code. Which a
11:49:30 25 lot of states right now are saying this is the

11:49:34 1 precedence they want to set. Let's say the
11:49:36 2 homes have to meet that standard and we have our
11:49:38 3 energy auditors coming in from TVA to say, we'll
11:49:40 4 help you figure out a way to get up to that
11:49:42 5 standard. Once they've met that standard, then
11:49:46 6 perhaps TVA could come in with the State of
11:49:48 7 Tennessee and add a little money to help along,
11:49:50 8 you know, to make those improvements. Then as
11:49:52 9 they add the panels to their homes, perhaps
11:49:56 10 again a little money coming along from TVA or
11:49:58 11 the State to help with that. So they become
11:50:00 12 cogenerators.

11:50:02 13 And this really serves two services.
11:50:06 14 It makes them an ownership, pride of ownership.
11:50:12 15 It also helps on your demand side and your
11:50:14 16 supply side. Because if the rating is that
11:50:16 17 during peak periods they actually pay more if
11:50:18 18 they use it but get a lot more coming in if they
11:50:22 19 sell it back to TVA, then you've got an
11:50:24 20 incentive for them to use less while they're
11:50:28 21 supplying more at the same time.

11:50:30 22 So I just think this is a win win for
11:50:32 23 everyone. I hope you'll take a look farther
11:50:36 24 along with a really massive campaign and I would
11:50:40 25 love to have any input with that. From my

11:50:42 1 background, I would love to help with that.

11:50:44 2 Thank you very much.

11:50:44 3 MR. FRANCIS: John Noel. He'll be

11:50:46 4 followed by Gil Hough.

11:50:50 5 MR. NOEL: Sarah, you mentioned

11:50:52 6 overload of information and I realize there's a

11:50:56 7 lot coming in. I would like to reference to the

11:51:00 8 cost of energy and I know that's what you're

11:51:04 9 dealing with. Health is a cost of energy. From

11:51:08 10 my perch of having sat on the Board of the

11:51:10 11 Climate Institute for 14 years with a number of

11:51:14 12 the people who authored -- principal authors of

11:51:16 13 the IPPC report, the International Panel on

11:51:22 14 Climate Change, in short, each one of those

11:51:24 15 people that sit on the board with me who have

11:51:26 16 dealt with this issue a long time are

11:51:28 17 essentially alarmed at the rate and the

11:51:30 18 escalation of global warming that is happening

11:51:34 19 today.

11:51:34 20 I think it's incumbent upon all of us,

11:51:38 21 public, TVA, to deal with the issue of carbon-

11:51:44 22 based fuels and what you're doing today is very

11:51:46 23 important to concentrate on and I would urge

11:51:52 24 haste.

11:51:52 25 I want to advance a scenario as well as

11:51:56 1 an idea and this has to do with time and money.
11:52:02 2 If you took \$6 billion to build a nuclear plant
11:52:08 3 and you took that money and you put it into
11:52:12 4 generating power in another area such as the
11:52:16 5 Midwest where the wind is the strongest and so
11:52:20 6 you took that money and you put it there and you
11:52:22 7 built a whole array of wind power so that you
11:52:28 8 could have some form of base load and you worked
11:52:30 9 with the grid system to get it back to you --
11:52:34 10 building the nuclear power plant you end up with
11:52:38 11 variable. What's the cost of the fuel going to
11:52:40 12 be in the 10 years it's going to take you to
11:52:42 13 build that plant? You can immediately start
11:52:44 14 generating power with the wind situations by
11:52:48 15 building it somewhere else where it might have
11:52:50 16 the best productivity.

11:52:54 17 This is where the environmental
11:52:56 18 community comes in and plays a role. I think
11:53:00 19 it's very difficult for you to get transmission
11:53:02 20 lines through a state today, taking it across a
11:53:08 21 pristine mountain or through a stream, or
11:53:10 22 whatever it might be. The environmental
11:53:10 23 community is not going to be pleased and
11:53:12 24 generally the public. However, if it is a
11:53:16 25 national concern to make sure that our power

11:53:18 1 grid nationally is as well designed and is up to
11:53:24 2 date as it possibly can be, it seems like that
11:53:28 3 there is a play that could be made for you to
11:53:30 4 put energy anywhere you want to and for the grid
11:53:34 5 to be completely connected and that come from a
11:53:36 6 Federal level, where the Federal government
11:53:40 7 says, we're going to connect that grid and we're
11:53:42 8 going to improve that grid. And if we do that,
11:53:44 9 then the environmental community, whether it be
11:53:46 10 NRDC, Environmental Defense, SACE, whoever it
11:53:50 11 happens to be, gets together and says, you
11:53:52 12 better believe it, we really need to do this and
11:53:54 13 we need to put this stuff under ground because
11:53:58 14 that is one of the primary objectives of moving
11:54:02 15 power in areas, both the visual effects and
11:54:06 16 whatever.

11:54:06 17 But in any event, there's a whole lot
11:54:10 18 more to those scenarios and that would play out
11:54:12 19 also with solar. Solar, while it's not a base
11:54:14 20 load, you could very easily supplement,
11:54:20 21 incentivize, taking that \$6 billion and get
11:54:22 22 power on the roof right now and look at the use
11:54:26 23 of time and money of building \$6 billion and
11:54:28 24 having that power come up in 10 years. I don't
11:54:30 25 think we can wait that long. Thanks.

11:54:32 1 MR. FRANCIS: Gil Hough. He'll be
11:54:34 2 followed by Mark Schwartz.

11:54:40 3 MR. HOUGH: First of all, I want to
11:54:40 4 thank the Board for having these two days on
11:54:44 5 efficiency and renewables. I think doing that
11:54:46 6 is just remarkable and I very much want to thank
11:54:50 7 everybody involved in that process. I think
11:54:52 8 it's very exciting that TVA is looking at
11:54:56 9 setting some goals for these two issues. I
11:54:58 10 think they work very well together. It's
11:55:00 11 extremely important.

11:55:02 12 I also think it is very important that
11:55:06 13 we do build whatever resources we do in the
11:55:08 14 Valley and don't look at spending money outside
11:55:10 15 until we've overcome some of the issues with
11:55:14 16 transmission.

11:55:16 17 I think when you are looking at
11:55:16 18 renewable energy, you really do want to look at
11:55:20 19 some of the benefits, water. I think some of
11:55:22 20 that shouldn't be underestimated as the price
11:55:26 21 hedge of the future. Everybody keeps thinking
11:55:28 22 natural gas prices are going down, but they
11:55:30 23 haven't been trending that way. I mean when you
11:55:32 24 look at, you know, wind and solar, you can
11:55:36 25 definitely see the benefits of -- you know, the

11:55:38 1 fuel cost is set over. Also, when you add these
11:55:42 2 things as assets, when you actually build them
11:55:44 3 yourselves, I think obviously once they're paid
11:55:46 4 for, most of these things have a very long life
11:55:50 5 span. And like hydro, it can be a very
11:55:52 6 positive, long-term asset to your organization.

11:55:58 7 Also, it's a great way to diversify.
11:56:00 8 Obviously you don't want to become too dependent
11:56:02 9 on any particular fuel source and obviously the
10 benefits to carbon are tremendous.

11:56:08 11 Why it has been stated that we, you
11:56:08 12 know, don't have some of the renewable resources
11:56:10 13 that other places do, I think it is notable that
11:56:14 14 where most of this is happening today, Germany
11:56:16 15 and Japan, have a lesser resource than we have
11:56:20 16 in the Valley. It does work here. It does work
11:56:22 17 very well.

11:56:24 18 I am a strong supporter of the
11:56:24 19 Generation Partners Program. I do encourage you
11:56:28 20 to continue that in a long-term commitment, not
11:56:30 21 just one more year of pilot at the present or
11:56:36 22 improved level of incentive. Obviously all --
11:56:40 23 you know, on this topic long term is much more
11:56:44 24 important than these one-year benefits if you're
11:56:44 25 looking at really building the infrastructure

11:56:48 1 here in the Valley.

11:56:48 2 The Generation Partners I think is
11:56:50 3 really important because it's a partnership that
11:56:52 4 has been built over a number of years with the
11:56:56 5 distributors, with TVA, with individual
11:56:58 6 citizens, and I don't think you'd want to
11:57:00 7 recreate that partnership that's already been
11:57:04 8 built. I think you'd want to build on that
11:57:06 9 partnership. And not to mention, it's a very
11:57:08 10 popular program with people like myself that
11:57:08 11 work on energy and renewables.

11:57:12 12 I think there are ways that could be
11:57:16 13 made to improve it, though. Right now it is
11:57:18 14 capped out at 50 kW which is relatively small.
11:57:22 15 You know, industry, commercial, flattops,
11:57:22 16 whether it's Walmart or Sharp wanting a larger
11:57:26 17 system, maybe you don't want to pay at the same
11:57:30 18 level of incentive, but having incentive built
11:57:30 19 in for larger systems, up to a megawatt, because
11:57:32 20 I know Nike, FedEx are very interested in having
11:57:36 21 solar on their buildings and I think it would be
11:57:38 22 good for TVA to have a program that would
11:57:40 23 encourage that behavior.

11:57:42 24 I also do definitely support a feed-in
11:57:46 25 tariff for larger than those 1 megawatt systems,

11:57:48 1 whether it's solar, wind, bio-energy. You know,
11:57:54 2 obviously you can set the price. It's different
11:57:56 3 in Europe. I don't imagine Europe-type feed-in
4 tariffs, but there that's like the thing. Here
5 you're talking federal government is going to be
11:58:04 6 doing it, the state is going to be doing things.

11:58:04 7 For you guys, if you had a set price
11:58:08 8 for wind, a set price for biomass, a set price
11:58:10 9 for solar for those large scales is a way I
11:58:12 10 think that's great, simple, which is great. I
11:58:16 11 think simple is always good and a feed-in tariff
11:58:18 12 can be a very simple way of promoting those
11:58:20 13 technologies. Thank you very much.

11:58:22 14 MR. FRANCIS: Mark Schwartz.

11:58:24 15 MR. SCHWARTZ: Well, like Dr. Downing
11:58:26 16 said, made the best Mark for last. I'm Mark
11:58:30 17 Schwartz. Some of y'all may know me. I'm
11:58:32 18 former principal architect for the State of
11:58:34 19 Tennessee and just recently was city architect
11:58:38 20 for metro Nashville. I managed the energy
11:58:38 21 environmental projects for both those entities
11:58:40 22 and now head a large sustainable design build
11:58:44 23 consortium of all Tennessee-based players in
11:58:48 24 what we call the green market.

11:58:50 25 I was also champion of the metro

11:58:52 1 Nashville forming its new LEED certifications
11:58:56 2 for all public buildings. And our team members,
11:58:58 3 some of which have submitted written comments to
11:59:02 4 this listening committee, have just completed
11:59:02 5 the first LEED gold homes project in Tennessee
11:59:06 6 and one of the first LEED gold homes in the
11:59:10 7 renovation categories in the United States for
11:59:10 8 another favorite son from Carthage, Tennessee.

11:59:16 9 One of the two things I want to speak
11:59:18 10 about -- and Sarah Smith and John Noel and even
11:59:20 11 David Bolt spoke about your Generation Partners
11:59:22 12 Program. But I was asked by David Tiller, who
11:59:24 13 is the Tennessee head of the Small Business
11:59:28 14 Administration, to speak to Generation Partners
11:59:30 15 Program about adding more bucks to that program,
11:59:32 16 so to speak. The Small Business Administration
11:59:36 17 likes to see loans for renewable energies and
11:59:38 18 energy component manufacturing. And because
11:59:42 19 there's not a strong incentive in Tennessee like
11:59:44 20 we have in other states that was mentioned
11:59:46 21 earlier, it's really hurting that loan program.
11:59:50 22 So we could promote green-collared jobs.

11:59:54 23 Interestingly enough, Hamilton County,
11:59:56 24 where your headquarters is, according to the
12:00:00 25 Sierra Club, is the largest county in Tennessee

12:00:02 1 to produce renewable energy manufacturing
12:00:04 2 components. And our green mark collaborative
12:00:08 3 is exploring a project now to do waste energy
12:00:10 4 and biomass projects in that region.
12:00:14 5 Interestingly enough, Hamilton County, the 13
12:00:16 6 counties, generates more cellulose, almost
12:00:20 7 60 percent of their waste stream. We're looking
12:00:24 8 to turn that waste into wealth or that trash
12:00:24 9 into treasure. We think certainly with your
12:00:26 10 coal generation facilities in TVA that biomass
12:00:32 11 is a good component, readily available,
12:00:34 12 literally drawing wealth out of the waste stream
12:00:38 13 here in Tennessee.

12:00:40 14 One of the things we'd like to also
12:00:42 15 note is that here in Tennessee, Englert Metals
12:00:46 16 out of Alcoa, Tennessee, already has a
12:00:52 17 photovoltaic thin film system called Energy
12:00:52 18 Peak that they laminate on site to the panels.
12:00:54 19 The reason for doing that is, as you know, when
12:00:58 20 you put somebody else's component on somebody
12:01:00 21 else's roof, you void that warranty. This new
12:01:02 22 Energy Peak Program which will be available to
12:01:06 23 Englert Metals in 2008 will be available to
12:01:08 24 other roofing manufacturers in 2009 and I think
12:01:12 25 that will solve some issues we've seen earlier

12:01:14 1 about putting somebody else's component on
12:01:16 2 somebody else's roof. Thank you for your time.

12:01:20 3 MR. FRANCIS: Members of the Board,
12:01:20 4 that concludes the public comment session.

12:01:24 5 MR. BOTTORFF: Well, Gil, thank you
12:01:26 6 very much. I want to thank everybody that came
12:01:28 7 on behalf of TVA and participated in this. I
12:01:30 8 want to specially thank the panelists. A number
12:01:32 9 of you, I know, traveled some distance to get
12:01:36 10 here and your comments have been very helpful.

12:01:38 11 I'll just remind you, we set out a
12:01:42 12 specific goal as part of the strategic plan.
12:01:44 13 Your comments will help us to refine that goal.
12:01:48 14 It is also going to helping us now formulate
12:01:50 15 more specific action plans. Those plans will be
12:01:54 16 published by the end of April and so at that
12:01:56 17 time we'll have other sessions in which you'll
12:02:00 18 have a chance to kind of review those action
12:02:04 19 steps, some substantive, some procedural, that
12:02:08 20 will be part of that. I encourage you to
12:02:10 21 participate in those as well, because together
12:02:12 22 we can make this happen. Thank you very much.

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1 REPORTER'S CERTIFICATE

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3

4 STATE OF TENNESSEE:
COUNTY OF KNOX:

5

6 I, Tracy A. Beamon, Certified Court
7 Reporter and Notary Public, do hereby certify
8 that I reported in machine shorthand the
9 March 5, 2008, Proceedings in the above-styled
10 cause; that the foregoing pages, numbered from
187 to 356, inclusive, were typed under my
personal supervision and constitute a true
record of said proceedings.

11 I further certify that I am not an attorney
12 or counsel of any of the parties, nor a relative
13 or employee of any attorney of counsel connected
with the action, nor financially interested in
the outcome of the action.

14 Witness my hand in the City of Knoxville,
15 County of Knox, State of Tennessee, this 28th
day of March, 2008.

16

17 Tracy A. Beamon, CCR-1003
18 My Commission Expires on the
12th day of February, 2011.

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